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The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

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[OFFICIAL NOTICE.]

Wrinkle Department, Western Gas Association.

OFFICE OF EDITOR, WRINKLE DEPARTMENT,
WESTERN GAS ASSOCIATION,
182 WISCONSIN STREET, MILWAUKEE, WIS.,
June 27th, 1905.

To the Members of the Western Gas Association: Your early attention and assistance are earnestly solicited in connection with the above Department for 1906. We are now ready to receive contributions and any device, plan, scheme, wrinkle, suggestion, formula or new method will be warmly welcomed. A full description, with sketch or photo, should accompany each contribution. Give us your help to make the 1906 Wrinkle Department a success. Thanking you in advance for your kind assistance, I remain, Yours truly, B. MCADAM, Editor.

[OFFICIAL NOTICE.]

Respecting the Official Work of the American Gas Light Association.

AMERICAN GAS LIGHT ASSOCIATION,
SECRETARY'S OFFICE,
530 Broadway, N. Y., Dec. 13, 1904.

To the Members American Gas Light Association: As there seems to be some misunderstanding respecting the standing of the official management of the Association, members will please note that the undersigned is the Secretary of the Association, and that Mr. A. E. Forstall is carrying forward the work of the Practical Class. All correspondence in connection with the Practical Class should therefore be addressed to Mr. A. E. Forstall, 58 William street, and all other matter pertaining to the Association to MR. GEORGE G. RAMSDELL, Secretary, at the above address.

[NOTICE.]

Wrinkle Department, Ohio Gas Light Association.

OHIO GAS LIGHT ASSOCIATION,
OFFICE OF THE WRINKLE DEPT.,
719 CITIZENS BUILDING,
CLEVELAND, O., June 13, 1905.

The Wrinkle Department of the Ohio Gas Light Association is now ready to receive contributions for the 1906 collection, and a sketch or description of all devices, formulæ and methods of accomplishing objects pertaining to the gas business, is respectfully solicited.

Please send a written explanation, accompanied by any sketch, photograph or drawing, to the above address, or a description alone will suffice.

Hoping to receive prompt compliance, Yours very truly,
W. E. STEINWEDELL, Editor.

BRIEFLY TOLD.

"THE DEMI-CENTENARY EVOLUTION OF THE GERMAN CONTINENTAL GAS ASSOCIATION."—This is the title of a handsomely gotten up pamphlet received recently. The subject treated, which is dealt with in concise manner, comprises a brief description of the inception, rise and condition to date of the Association named. The reader should understand, however, that the name is somewhat misleading to American ideas, for the "Association" is really *not* an "Association," as we understand the word; but rather an organization on the order of the United Gas Improvement Company, as is, too, that other great gas corporation, "The Imperial Continental Gas Association," of London, England. The German Company named owns 11 "gas centrals," comprising 19 gas works, which supply 44 cities and towns. It also owns one electric lighting plant, a chemical works and a "main shop" at Dessau, where is manufactured nearly everything required at the various plants. The

chemical works which the Company owns are utilized to work up the by-products of the various plants to the best advantage, which seems to be a very good idea under the conditions prevailing there. An interesting item in said pamphlet is the one dealing with improvements in methods for carbonizing or coking gas coals. The compiler of the pamphlet, who may have been our old friend, Herr Wm. von Oechelhaeuser, General Manager of the Company, remarks that the Company had not built any inclined retorts, partly because of the greater first cost, partly because it did not require any extensive additions for the time being, but principally because it had considered the inclined retort system as a sort of preliminary stage of a change from the horizontal to real vertical retorts. Extensive and exhaustive trials had been made with the latter, and the experimenters were looking with good hopes for the future introduction of the "standing" (vertical) retorts. Indeed, they thought so well of the "standing" retorts, that they formed a sort of side-line company, with headquarters at Berlin, for the further exploitation of that system. Through the inventions of the Chief Chemist, Dr. Bueb, the Company was enabled to overcome almost entirely the old arch enemy, naphthaline, and the stoppages in service pipes caused by "freeze offs," and to make of a former nuisance almost a source of revenue. Ammonia is worked up mostly at all the works; so is cyanogen; but the tar mainly goes to the chemical factory at Warsaw. Coke (for the Company is a pronounced believer in the superiority of coal gas) is taken care of locally. A commendable feature practiced by the Company is a pension fund, instituted by the corporation by means of a substantial contribution in the first place, and kept up by small contributions from the employees and salaried officers themselves, as well as by annual contributions from the profits of the Company, set aside for the purpose and with the object of securing to worthy, faithful employees a prospect of a living, when the time comes that the young man having grown old has naturally to be "called in." This feature is not only one which relieves the older officials from carking care, but is such an assurance to the young officers as well as to spur them on to devote their best energies to their employer's services; and so it pays all concerned. The balance sheets of the Company go to show that it is in a very healthy condition financially, and that stockholders, officers *and* the public, have "no kick coming" to them on any account. The principal offices of the Company are at Dessau, Anhalt, Germany.—F. E.

NOTES—

THE semi-annual report of Mr. A. P. Lathrop, General Manager of the Detroit City Gas Company, to the Comptroller of Detroit, which report is made in accordance with the provisions of the Company's franchise, showed that its output for the 6 months ended June 30 last amounted to 343,541,000 cubic feet. This total represents a gain of over 43,000,000 cubic feet as compared with the previous 6 months. Under the franchise the Company must sell gas at 80 cents per 1,000 cubic feet when its yearly output reaches 800,000,000 cubic feet.

MANAGER DIFFENDERFER, of the Dauphin County (Pa.) Gas Company, is negotiating with the authorities of the borough of New Cumberland for the right to supply gas therein.

MR. W. H. FRITCHMAN has been appointed General Manager of the Mahanoy City (Pa.) Gas Light Company.

A RATHER far-in-advance attempt to meet De Land's needs as a busy settlement would seem the proposition to there establish a gas plant. De Land is a wideawake settlement in Florida, it is true, but it looks to us that the time for such a project there is not now. The main mover in the premises is a Mr. John H. Kruse, who is, we believe, a resident of Jacksonville, Fla.

THE gas plant at Beatrice, Neb., has been sold to New York capitalists by Mr. A. S. Maxwell. The purchasers propose to rebuild the works, and it is estimated that if the work is done properly the cost thereof will not be less than $25,000. Mr. Maxwell will remain as local manager.

MESSRS. W. E. MOSS and associates have purchased a controlling interest in the stock of the Coldwater (Mich.) Gas Light and Fuel Company.

THE proprietors of the Fall River (Mass.) Gas Works Company have declared a semi-annual dividend of $5 per share.

THERE seems some truth in the rumor that the Public Service Corporation, of New Jersey, is conducting a canvas for the purpose of acquiring the gas and electric lighting plants at Atlantic City, Wildwood and Ocean City, N. J.

[OFFICIAL REPORT.—REVISED BY THE SECRETARY.—CONTINUED FROM PAGE 91.]

TWENTY-EIGHTH ANNUAL MEETING, WESTERN GAS ASSOCIATION.

HELD AT CHICAGO, ILLS., IN THE AUDITORIUM HOTEL, MAY 17, 18 AND 19.

SECOND DAY, MORNING SESSION.

Joint Discussion on the Mitchell and Miller Papers.[1]

The President—Gentlemen, I would like to have the discussion on these two papers free and unlimited. Who will start it?

Mr. Wheeler—Mr. Mitchell says that 4.27 gallons of oil are required to produce 1,000 cubic feet of gas, with a candle power of 22. I presume he means to enrich. These figures indicate that the efficiency of the oil was 5.1 candles per gallon, which is an indication possibly that the Kansas oil is not quite as good an enricher as the Texas oil, which Mr. Miller says in Beaumont yields 5.74 candles per gallon, or as the Jennings oil, which yields 6.11 candles per gallon.

Mr. Baehr—I might confirm the statements made in the paper by Mr. Mitchell of the difficulty of getting the same candle power results in water gas manufacture with Kansas oil in winter that you get in summer. We have had that difficulty, and I understand that Kansas City has also had a like difficulty. I happened to be at Kansas City about 2 weeks ago, and was told that they are now getting 6½-candle power per gallon of oil used, but in winter they did not get that much. Our experience in St. Louis confirms that.

The President—Is Mr. Macbeth, of Kansas City, in the room? We should like to hear from him. Mr. Waring, will you say a few words on the subject?

Mr. Mitchell—In reply to Mr. Wheeler, I will say that we are using the distillate. The crude oil will give us unquestionably 5 candles and over per gallon.

The President—I believe that this classification of oils in candles per gallon is a good deal misleading. It depends largely on the candle power of the gas that you are making. If you make a low candle power gas your candles per gallon are necessarily low. After you reach 18 or 19 candles, every particle of oil that you add increases its efficiency in delivering the candles per gallon. In making a statement of candles per gallon, the candle power of the gas should also be stated. There seems to be no disposition to further discuss this paper. Have you anything further to say, Mr. Miller? If not, a vote of thanks is in order.

On motion of the Secretary a vote of thanks was extended to Messrs. Miller and Mitchell for their interesting papers.

DEFERRED BUSINESS.

The President—We will now take up the deferred business of yesterday, reading of minutes, etc.

On motion the reading of the minutes was dispensed with, inasmuch as the same had been published in the AMERICAN GAS LIGHT JOURNAL.

Mr. Butterworth—Mr. President, I move that we follow the method of ascertaining who are present at our meetings that is employed by the American Gas Light Association, or some similar method. I have estimated that our total expenses here are about $20 a minute; if it takes 20 minutes to call this roll, the roll call costs us about $400. I move that we adopt the method employed by the American Gas Light Association, which as you know is a system of giving your name at the door as you enter the convention room for the first time.

The Secretary—I second the motion. It will be necessary to amend our by-laws, but if you will consider that in the form of a resolution I will draw one up.

Mr. Butterworth—All right.

The Secretary—And all that is necessary is to read it three times, which you can presume has been done, and if passed by a majority of the members it will be the law. I second the amendment to the by-laws offered by Mr. Butterworth.

The President—In what way would the by-laws necessarily be amended? The order of business?

The Secretary—Article 1; yes.

The President—It does not state how the roll shall be called, however. We could call the roll by the card system as well as calling it vocally, it seems to me. It simply says, "Calling the roll."

The Secretary—I second Mr. Butterworth's motion.

The President—Gentlemen, you have heard the motion, that in the future the roll be called by this Association by the card system, as now

1. For the text of the papers, see JOURNAL, July 17, 1905.

in use by the American Association. Nobody, I think, doubts the wisdom of this motion. If there are no further remarks I will put the question. [Put and adopted.]

Mr. Butterworth—I have another motion that I would like to make in this connection. Our numbers are getting quite large. We are a large Association now, and take in about 100 new members at each meeting. It is impossible for us to know each other personally. I, therefore, move that we try, at our next meeting at least, the method for identifying each other that is employed, for instance, by some of the larger electric light associations. The National Electric Light Association has a system by which each person who attends the convention registers on his arrival and is given a serial number. A white button, on which that number is conspicuously printed, is then pinned to the lapel of his coat. The figures are of large size, so that anybody can read them at some little distance. He is given that corresponding number on the register. At the first intermission between sessions a leaflet or bulletin containing the names of those then present is distributed to all the members, each name having the number which has been assigned to it. Revised lists are distributed later during the meeting containing the names of new arrivals; therefore, throughout the meeting, by referring to your book you can easily ascertain who any man is whom you may meet, without asking him his name or without seeking an introduction. I move that this method, Mr. President, be tried at the next meeting of our Association, so that we can recognize each other.

The President—That is also one of Mr. Butterworth's many bright ideas, and I am very glad to put the motion. I would be glad, though, if the motion would be amended to call for a committee of one to take that matter up for the next meeting. If somebody will amend the motion to that effect.

Mr. Butterworth—I will stand for that amendment. Any good way of doing this is satisfactory to me. I don't care what method it is.

The President—It is better to put a proposition of that kind up to one man to attend to.

Mr. Butterworth—All right, I move that that be done.

The President—The motion then is that a committee of one be appointed to provide some means, presumably the same means used by the National Electric Light Association, for the identification of new members of this Association.

Mr. Butterworth—All members.

The President—Oh, I thought it applied only to new members.

Mr. Butterworth—No; to all of them.

The President—All members of this Association, then. That includes new members, however, admitted at the meeting?

Mr. Butterworth—Yes, sir.

The President—You have heard the motion. Are there any remarks? [The motion was adopted.]

The President appointed Mr. Butterworth a committee of one to attend to the details.

Letters of Regret.

The Secretary then read many letters from those connected with the industry expressing the regret of the writers at their inability to be present at the meeting.

Vice-President Doty assumed the Chair. He introduced Mr. Fred. B. Wheeler, of Detroit, Mich., who read the following paper on

THE PRACTICAL ENRICHMENT OF LOW CANDLE POWER GAS WITH BFNZOL: ITS CONVENIENCE AND ADVANTAGES:

It can safely be asserted that up to quite a recent date but little has been heard in American gas engineering practice of the enrichment of low candle power gas with benzol, although references are occasionally seen in the gas jurnals to its use in Europe, successfully be it said. It is purposed to show in this paper what benzol is, what the sources of supply are, and what can be done with it in the line of raising low grade coal gas speedily and surely to a desired high candle power which will stay put.

Benzol is the product either of the destructive distillation and refining of gas house and coke oven tars, or of the washing of coke oven gas with absorbing oil and its distillation.

Benzol is the commercial name for the complex light oil produced from either of the above processes, and containing benzene (C_6H_6) as its principal part. In Europe benzol was first produced from gas house tar by means of a double distillation. The first distillation was stopped at 170° C. (338° F.) The product was again distilled, the fraction coming off to 100° C. (212° F.), being called 90 per cent. benzol.

The English distilled benzol consists in general of the following:

Table I.

70 per cent.	benzene.	Boiling point,	80.5° C.	176° F.
25 "	toluene.	"	110° C.	230° F.
1 "	xylene.	"	137° C.	278° F.
4 "	paraffines, etc.			
100 "				

With specific gravity of 0.880 to 0.882.
Vide Butterfield, pp. 306, 307.

It will be seen from this table of composition that 95 per cent. of the volume boils below 110° C. (230° F.), a boiling point only just above the formation of steam and greatly below the temperature of steam at 100 pounds pressure 164° C. (327° F). The German tar distilled benzol is almost identical with the above sample.

German coke ovens are a source of considerable benzol production. Annually 8,000,000 gallons of benzol are produced, a large part of which is sold to gas companies for enriching. Now the American coke ovens are distilling their product. The American by-product coke oven companies are giving their attention to the manufacture of benzols of similar quality to the German manufacturers. This product is obtained by washing the gas with an absorbing oil—contained in a washer. The gas flowing into this washer bubbles through the absorbing oil and gives up practically all of the soluble components that are light-giving in the gas to the oil.

The oil circulates from the washer to the still, and in the still is steam distilled, the vapors of the operation upon condensation becoming the benzol of commerce. The commercial benzol thus obtained is in general of the following composition.

Table II.

Benzene	76.5
Toluene	15.5
Xylene	4.5
Paraffines	3.5
	100.0
Specific gravity	0.882

It will be at once noted from Table II. that 92 per cent. of volume evaporates at 110° C. (230° F.), while the amount of the valuable benzene content exceeds that in the foreign product by 6.5 per cent.—the specific gravity being the same—and this product is the standard coke oven benzol for gas enrichment. This product is transported by rail in drums or tank cars, exactly the same as petroleum.

It is now proposed to show what can be done with benzol in the line of enriching low grade coal gas speedily and surely to a desired high candle power, as permanent as any high candle power can be.

In O'Connor's "Gas Engineer's Pocket Book," pages 387, 388 and 389, 2d Ed., 1901, are 3 pages of notes on German and English experience in the use of various grades of benzol. These notes show wide disparity in the results obtained by different experimenters, and are almost valueless, as they give little information as to the quality, purity or source of manufacture of the benzols used. The notes are for the most part unsigned, many of them are flatly contradictory to each other, and some mention the use of cold benzol, manifestly an improper method.

Butterfield, head chemist at Beckton, says, p. 149, "Chemistry of Gas Manufacture:" "No experimental data in support of doubts on the high value of benzol as an enriching agent have yet come to the author's notice."

European Experiments.—In a very large number of English gas works, the Clark Maxim process of enriching by carburine, a petroleum spirit miscalled benzol, has been in use. However, this has been mostly discontinued because it has been found to be a non-permanent form of enrichment. Carburine vapor has only about one-fourth the enriching value of benzol vapor at the same temperattures.

In Germany, as stated above, 8,000,000 gallons of benzol are produced from the by-product coke ovens, nearly all of which is used in Continental gas works.

Its Use is on the Increase Everywhere.—Dr. H. Bunte, the great German gas engineer (see *Journal für Gasbeleuchtung*, Vol. XXXVI., p. 442), (*Journal of Gas Lighting*, Vol. LXII., p. 717), says, benzol vapor has volume for volume, or weight for weight, a far higher enriching power than hexane or other paraffines. Weight for weight he finds benzol secures nearly 2½ times the lighting effect of hexane. He estimates that 1 gallon of benzol will raise 24,500 cubic feet of 16-candle power coal gas, one candle in illuminating power. (*Journal für Gasbeleuchtung*, Vol. XXXVII., p. 81.) (*Journal of Gas Lighting*, Vol. LXIII., p. 485.) He also says that at 0° C. (32° F.) coal gas will

carry 3 per cent. by volume of benzol vapors, making a very rich gas.

American Benzol Enrichment Experiments.—In the spring of 1904 an installation was made at a plant we will call A. In May the output was 21,866,400 cubic feet, or 705,368 cubic feet per day. For the purpose of this experiment, the initial candle power was 13.48, which was brought up to 18.55, a rise of 5.07 candles by the use of 0.207 of a gallon of benzol, or 0.0408 of a gallon per 1,000 cubic feet per candle. To put it in another way, the number of cubic feet raised 1 candle by 1 gallon was 24,491. It will be observed this figure is almost exactly that quoted above from Dr. Bunte. This experiment covered 30 days' time.

This gas was held during this period at an average chemical composition of:

TABLE III.

CO_2	2.0
C_6H_6	.8
C_2H_4	3.9
O_2	0.3
CO	5.0
CH_4	39.6
H_2	39.0
N	9.4
	100.0

The B.T.U.'s were, before enrichment..... 667 gross.
" " " after " ..... 675 "

During the next 15 days the amounts of oxygen and nitrogen were purposely increased to reduce the heat units and flame temperature. The results are shown in—

TABLE IV.

24 Hours Ending 7 A.M.	Candle Power—Initial.	Candle Power—Enriched.	Gallons Benzol Used.	Gallons Benzol per 1,000 Cubic Feet Gas.	Candles Enriched.	Cubic feet of Gas 1 Gallon 1 Candle.
June 3	12.90	18.27	193.57	.2010	5.27	26,709
" 4	14.02	18.40	112.23	.1370	4.38	31,965
" 5	15.71	18.67	112.23	.1339	2.96	22,102
" 6	13.12	17.70	185.31	.2121	4.58	21,587
" 7	12.80	18.16	171.39	.2024	5 36	26,473
" 8	15.12	18.24	73.95	.0906	3.12	34,414
" 9	15.83	17.74	46.11	.0535	1.91	35,648
" 10	11.14	18.20	301.89	.2793	7.55	20,222
" 11	11.25	18.14	314.07	.3110	5.89	31,407
" 12	13.90	17.76	136.59	.1322	5.86	29,189
" 13	15.06	18.58	148.77	.1486	3.52	23,683
" 14	14.75	17.45	107.88	.1171	2.70	23,045
" 15	13.32	17.85	168.78	.1697	4.53	26,690
" 16	12.94	16.84	194.88	.1927	3.95	20,553

During the test the following results were obtained:

Initial candle power	13.70
Enriched candle power	18.00
Increase in candles	4.30
Cubic feet gas	13,066,800.00
Gallons benzol used	2,267.65
Gallons benzol used per 1,000	0.1735
1 gallon enriched 1 candle	24,783. cu. ft.

The average chemical composition of the enriched gas was:

TABLE V.

CO_2	2.0
C_6H_6	.8
C_2H_4	3.3
O_2	1.6
CO	5.3
CH_4	40.0
H_2	35.7
N	11.3
	100.0

Attention is again called to the fact that the oxygen and nitrogen content was purposely increased.

The B.T.U.'s were before enrichment....645 gross
" " " after " ....655 "

This gas was pumped through a 10-inch main 1 mile long, and at the delivery point after purification showed no change in candle power. The above experiments were made in the late spring. The effects of cold remained to be determined.

Ordinary coal gas of 18 candles usually carries at least 1 per cent. of benzene C_6H_6, and has been transmitted through mains with extreme conditions of temperature for many years with no extraordinary loss.

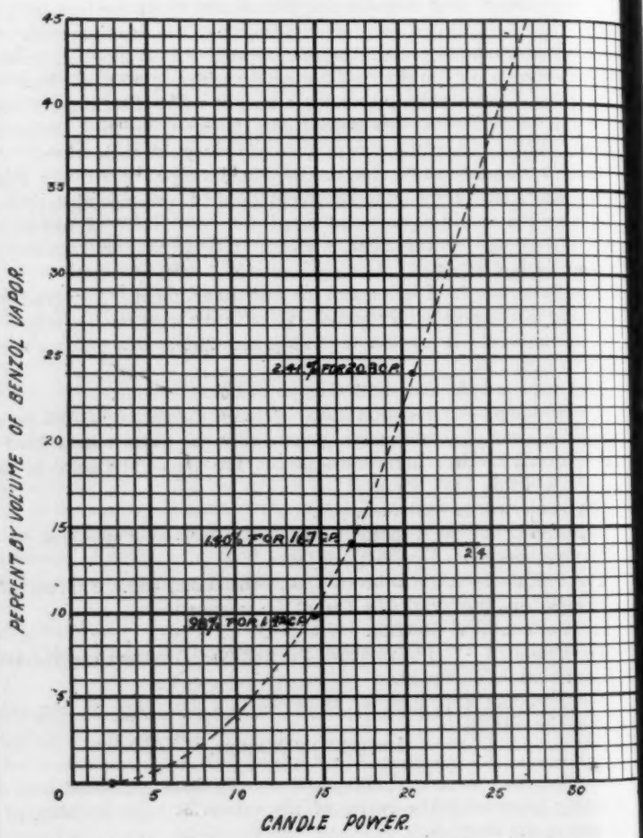
The following table of benzol vapor in coal gas is of interest:

TABLE VI.

Temperature. C.	Temperature. F.	Cu. Ft. C_6H_6 Vapor contained in 100 Cu. Ft. Gas.
—10	+ 14	1.70
— 5	+ 23	2.41
0	+ 32	3.33
+ 5	+ 41	4.49
+10	+ 50	5.95

In the graphical chart, it is shown that in a coal gas freed from ethylene, at a volume of 1.4 per cent. of benzol there is a 16.7 candle power. Then if the gas had an initial candle power due to ethylene of say 7, there will be obtained a 24-candle gas. The above table VI. shows that at 14° F., 1.7 per cent. C_6H_6 can be in coal gas. This is 18° F. below freezing point. It may not be generally known that when the ground is frozen to the bottom of a gas main, the temperature of the interior of the pipe is rarely below 0° C. (32° F.) Hence from the above table we see that the carrying power of coal gas at 32° F., is much above the volume of C_6H_6 usually found in the best coal gas.

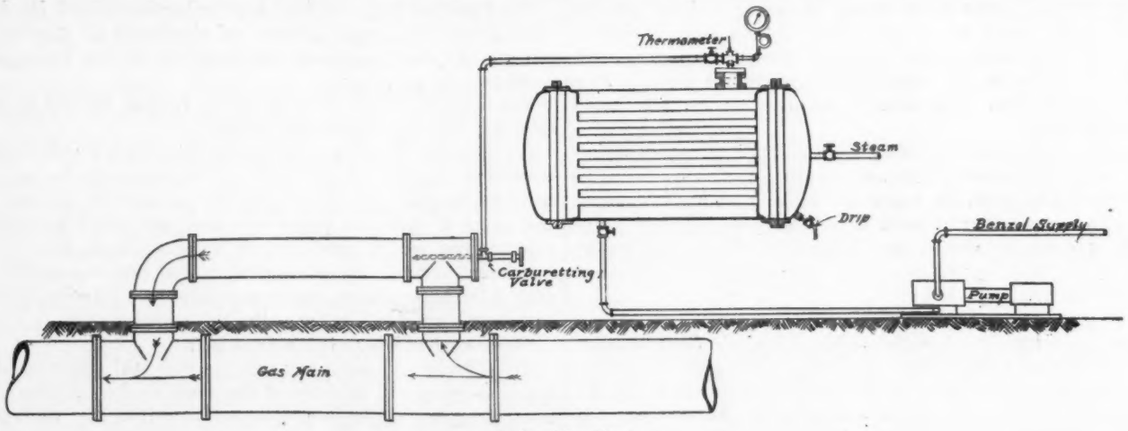
GRAPHICAL CHART SHOWING CANDLE POWER AND BENZOL VAPOR IN COAL GAS FREED FROM ETHYLENE



Butterfield (p. 149, Ed. 1896) says: "There is ample margin even at 0°C. (32° F.) for the retention in gas of sufficient benzol vapor to give it an illuminating power of 25 candles."

We may confidently expect then to find no more loss or condensation than with unenriched high grade coal gas, or cannel coal gas. It was deemed desirable to confirm the previous test in very cold weather. An opportunity was offered at Plant B. It was decided to test the candle power on the start, and after it had travelled several miles through a very shallow pipe and in zero weather. The output from this particular works was pumped through a 16-inch main more than 2 miles long, laid for at least 1 mile just under the paving stones. Arrangements were made to take the temperature of the gas flowing in the mains, also to read constantly the candle powers at both ends. During the journey of the gas it was under about 2 pounds pressure.

A series of experiments were made to determine absolutely the drop of candle power of the gas *entirely unenriched*, and transmitted under



Carburetting Plant.

varying conditions. The gas was then enriched by benzol to different candle powers, some as high as 23, and transmitted under like conditions. The temperature of the gas at the station meter varied but slightly from 60° F. The temperature of the gas flowing through the shallow main was 37° F., a 23° F. drop from the station meter. The gas was delivered at a temperature of 42° F. to 47° F. through a section of deep laid cast iron 20-inch main. The outside air temperature varied from −15° F. to 34° F., and the ground was frozen to a depth of 3 feet.

The loss in transmission was determined, then enrichment began under the same conditions as before. The benzol used had the identical composition of that in Table II. The results were as follows:

TABLE VII.—*Consecutive Days.*

Day.	Initial Unenriched.	Enriched.	Raise in Candles.
1.....	11.87	20.05	8.18
2.....	13.05	19.64	6.59
3.....	14.45	20.72	6.27
4.....	14.98	20.98	6.00
5.....	14.66	20.77	6.11
6.....	14.14	20.80	6.66
Average.....	13 86	20.49	6.63

The average amount of benzol used was 0.3285 gallons for a 6.63-candle rise, or 1 gallon raised 20,000 feet, an average of 1 candle. The temperature of the main remained constant at 37° F. The average loss in candles at the end of the long travel under 2 pounds pressure was 0.28 of a candle.

TABLE VIII.—*Second Period, Consecutive Days.*

Day.	Initial Unenriched.	Enriched.	Raise in Candles.	Benzol Used.
1.....	13.20	20.59	7.39	.3399
2.....	13.00	19.92	6.92	.3182
3.....	13.03	20 38	7.35	.3308
4.....	13.21	20.47	7 26	.3484
5.....	14.01	20.35	6.34	.2917
6.....	16.18	20.89	4.71	.2356
7.....	16.09	20.90	3.81	.1957
8.....	15.07	19.26	4.19	.1926
Average.....	14.22	20.34	6.12	.2516

The average amount of benzol used was 0.2816 gallons. The average candle power raise was 6.12 candles, equal to 0.0460 gallons to raise 1,000 feet 1 candle, or 1 gallon raised 21,739 feet 1 candle. The average loss in transmission was 0.24 candles. The figures here obtained were checked at a third plant having the same length of pipe line and same general conditions. The temperature of the main was exactly the same −37° F. The gas here had an average initial candle power of 8.15; was raised 9.22 candles to 17.37 candles; measured at its 2-mile journey's by 0.384 gallons of benzol, giving thus an enriching value of 24,039 cubic feet, 1 candle from 1 gallon.

Further experiments have since been made to determine the value of benzol for enriching very lean gas, containing as high as 2 per cent. oxygen. For 4 days in Plant B, the average initial was held at 6.94; the average rise was 11.48, and the enriching value with this high per cent. of air was 22,000 cubic feet per gallon.

At a fourth plant the benzol enriched gas was pumped under pressures varying from 7½ to 10 pounds through a 12-inch main 38 miles long. The gas had an average initial candle power of 14, was raised to 18 8-candle power. and after its long journey arrived under pressure at 18.6-candle power, a loss of only 0.20 candles. Later, under somewhat different conditions, the loss was an average of 0.80 candles.

The question of high pressure transmission on the quality of any illuminating gas is important. It will be well to observe that recently Mr. J. D. Shattuck[1] states that for 6 months coal gas was pumped, and for 6 months water gas, under a 25-pound pressure at his works. The loss with coal gas was 0.33 candles, and with water gas 0.90 candles. Compare these figures with results on benzolized coal gas given above.

The quickness and ready convenience of the method will commend itself to all from the following description: The diagram shows a complete enriching plant. The benzol is fed to the vaporizer from a suitable measuring tank by a small duplex pump. The vaporizer consists of a boiler in which the oil is outside of the steam heated tubes. These tubes have sufficient surface to evaporate in the plant shown, benzol enough to enrich 3,000,000 feet of 6 candle coal gas 12 or 14 candles. The plant shown occupies a ground floor area of scarcely 4 feet by 9 feet. The vaporizer has a vapor pressure gauge on the top, also a thermometer. With a steam pressure at the plant of 80 to 100 pounds, a vapor pressure of 30 pounds, a temperature of 130° to 440° C. (284° F.) is maintained. The vapor passes through a carburetting needle valve into a small by-pass on the gas main. The gas flow sweeps the vapor along into the gas flowing in the main.

The steam is first turned into the vaporizer, then the benzol pump is started and the needle valve opened when the vapor pressure gauge shows, say, 10 pounds pressure. This operation in the vaporizer shown here does not take more than 5 minutes. The vapor pressure is usually carried at a point from 20 to 30 pounds. A steady flow of vapor passes into the gas main as long as the steam pressure is maintained.

The volume of benzol vaporized, and consequently the amount of enricher fed, are regulated by the needle valve opening, the pump speed and the steam valve opening. The amount of steam used is nominal, as all pipes and the vaporizer are lagged.

The method is speedy, almost instantaneous, in fact, economical to operate, requires no extra labor, and in 5 minutes can raise a 6-candle, blue-air coal gas to 16, 18 or more candles with an amount of oil equivalent to about 0.04 of a gallon per candle per 1,000.

In this country gas companies, especially the smaller ones, have hitherto had their choice of methods of enrichment confined to the use of cannel coal, water gas, or of some form of oil gas generated in their benches.

At present the use of cannel coal enrichment is nearly obsolete, on account of the price of cannel as well as on account of the irregularity and uncertainty of the candle powers obtained, and because of the deterioration of the quality of coke produced when cannel is used. Most small gas companies cannot afford the capital cost of a small water gas installation simply as an enriching adjunct to their plants. The uses of most of the forms of oil gas enrichment are extremely wasteful and expensive. The cost of the enrichment per candle is at many small coal gas plants extremely high, the writer knowing of plants where the cost has been as high as 5 cents per candle. No small gas plant should have an enriching cost higher than 1.25 cents per candle. The method of benzol enrichment outlined above possesses all the elements desired by most small gas plants for speedy, economical enrichment of their coal gas. The rapidity and ease of starting up the apparatus to full work-

1. Proceedings, Ohio Gas Light Association; Pittsburgh, 1905.

ing capacity, its small steam consumption, its negligible labor cost, its low interest charge make up a combination that no other enriching system has. It will enable them to take off a very much higher yield per pound and yet reach any reasonable desired candle power. Particular attention is called to this feature permitted by the installation of the benzol method.

The first cost of the benzol enriching plant is small, its space requirement is a corner, its simplicity is so apparent that it must commend itself to all managers requiring a coal gas delivery above 15 candles, whose works are unable to install an expensive enriching plant. For a small coal gas works, the cost per candle of enrichment is lower by the benzol method than by the use of any other method of enrichment known to the writer.

Discussion.

Vice-President Doty—You have heard Mr. Wheeler's scientific paper. Mr. Wheeler presents a new method of enrichment to you. Those who know Mr. Wheeler know him to be the type of engineer of which Mr. Chollar speaks, not only an engineer by diploma but an engineer who knows how. The subject is open for discussion. Mr. Lathrop, you have had experience with benzol enrichment?

Mr. Lathrop—We have had only a little experience, so I am not able to say anything in particular about it. We hope to have more experience in the course of a year.

Vice-President Doty—Professor Turneaure, would you like to enter into this discussion?

Prof. Turneaure—It is a subject for investigation.

Vice-President Doty—Mr. Forstall?

Mr. Forstall—Anything that I might say would merely bear upon previous literature, which Mr. Wheeler has already gone over in his paper. I have had no actual experience with benzol enrichment, and personally I am not very strongly in favor of vapor enrichment of any kind. You can get enrichment for nearly the same cost with permanent gas.

Vice-President Doty—Would you then want to take the position of advocating water gas as an enricher?

Mr. Forstall—I think it is more permanent.

Vice-President Doty—I hope, gentlemen, there will be a discussion of a paper of such value as this. If there is to be no discussion, it would be better to my mind to take the paper as read and save the Association's time, the value of which Mr. Butterworth has spoken. The value of these papers to a certain extent lies in the discussion. The officers of the convention can prepare a paper list for you and print it, and you can read at your leisure at your homes, but as I understand the great value of these Association meetings is in the discussion. Mr. Mitchell.

Mr. Mitchell—Mr. President, I believe that the arrangement as shown on the illustration here would be a grand arrangement for those troubled with naphthaline. This will greatly assist in preventing and in dissolving the naphthaline in gas.

Mr. Elbert—In looking over this illustration, it seemed to me that Mr. Wheeler would get better results from the heater if it stood vertically instead of horizontally; that is, he would get greater efficiency out of the heater.

Vice-President Doty—Mr. Butterworth, have you had experience with benzol enrichment?

Mr. Butterworth—I have not.

Vice-President Doty—Mr. Miller.

Mr. Miller—I have not anything to say on those lines of enrichment.

Vice-President Doty—Mr. Slater?

Mr. Slater—Mr. President, in regard to the use of benzol for enrichment, I think the results that have been obtained in Europe very well substantiate the fact that it is a good enricher, and I am very glad Mr. Wheeler reported favorably on it. At the meeting of the New England Association of Gas Engineers, in 1902, I made some remarks touching upon benzol as an enricher, and they were very intelligently criticised, but one of the gentlemen implying that it was not of special value as an enricher. I think that the figures Mr. Wheeler has given can be very well substantiated; in fact I know by private correspondence with European engineers that they are. Regarding the matter of naphthaline, as stated by Mr. Mitchell, I think that is a point which deserves very careful attention, because it is a valuable point for a gas man. Benzol is one of the best solvents of naphthaline and a good carrier. If proper attention is given to climatic conditions where the benzol is used, very excellent results can be attained, both in regard to candle power and to the satisfaction with the operating condition of the mains as regards naphthaline.

Vice-President Doty—Mr. Baehr?

Mr. Baehr—I don't believe I can say anything about this at present.

Vice-President Doty—Is there any further discussion? Mr. McDonald.

Mr. Donald McDonald—I have had absolutely no experience on this subject. Anybody else here can speak as well as I can. I don't see that I can say anything.

Vice-President Doty—If there is no further discussion, I will call upon Mr. Wheeler to close the debate.

Mr. Wheeler—I realize, gentlemen, that this is a new subject, and I know that very few of you have had experience in its use, but if you could see the readiness with which you can speed up this small machine and make a 20-candle power gas that will stand pumping in any weather, you would appreciate its value. I think that the gas is as permanent under the same temperature and pressure conditions as any gas. I fail to see where there is any difference between benzol gas and any other kind of gas, so far as the transmission goes.

Vice-President Doty—Is it a fixed gas?

Mr. Wheeler—You can mix this gas with coal gas or water gas, and it will carry as well as either of the gases singly. As I say, the gas is being pumped 38 miles, and it carries as well as any water gas or coal gas that any of you are familiar with.

Mr. Slater—The Chairman made a remark some time ago that brought an idea to my mind, one I think could be well carried out. It is this: Our Associations very often have papers brought before them that in the time usually available are very difficult to sufficiently digest or discuss properly at the meetings at which they are presented. I know of at least one Association that does make a practice of assigning the subjects for further discuseion at the next meeting, even though they meet only annually. The interval seems long, but that I have found has brought good results and has been the means of having the subjects thoroughly brought out, and any fallacies in the original paper brought to light and disposed of, and the good points also were brought out more pointedly, and good points that might not be touched on in the paper have also been brought out. I think that such a thing could well be done by our Gas Associations.

Vice-President Doty—I expect to have something to say on that question this afternoon, Mr. Slater, unless plans fail.

On motion of the Secretary a vote of thanks was tendered to Mr. Wheeler for his very able paper, in which there is so much evidence of thought and research.

Vice-President Doty—The next order of business is the report of the Committee on President's Address. Mr. E. G. Pratt is the Chairman. Mr. Forstall, you are a member of that committee.

Mr. Forstall—Mr. Pratt has both copies of that report, and I have not any. In his absence I cannot present the report.

Vice-President Doty—You ask to be excused, then? The next order of business is

THE REPORT OF COMMITTEE ON PLACE OF NEXT MEETING.

Mr. Barret is Chairman of that committee.

Mr. Barret—Mr. President, Mr. McDonald will present that report.

Mr. McDonald—Mr. President, the committee would report for the consideration of the Association, Cleveland as the next place of meeting.

Vice-President Doty—You have heard the report of the committee naming Cleveland for your consideration. What is your pleasure gentlemen?

Mr. Mitchell—I move the adoption of the report. [Seconded.]

Vice-President Doty—It is regularly moved and seconded that the report be adopted and Cleveland be selected as the next place of meeting. [The motion was adopted.]

Vice-President Doty—Report of the Library Committee.

The Secretary—Mr. Thwing has the report.

Vice-President Doty—The report of the Library Committee is called for, but by reason of the absence of the Chairman it will have to be deferred.

ADDITIONAL REPORT FROM THE MEMBERSHIP COMMITTEE.

Vice-President Doty—It has been suggested, gentlemen, that we have a further report from the Membership Committee. In view of their activities, there are more new members to be elected. If there is no objection I will call for the report of the Membership Commiutee. Mr. Wm. McDonald.

Mr. McDonald—The following additional gentlemen have applied for membership in the Association:

Active.

Abell, W. A., Taylorville, Ills.	Miller, R. L., Muncie, Ind.
Connors, M. Chicago, Ills.	Richards, F. M., Madison, Wis.
Farr, A. L., Chicago, Ills.	Stratton, C. J., Chicago, Ills.
Gross, A. H., Chicago, Ills.	Scott, E., La Porte, Ind.
Higgins, H. C., Dixon, Ills.	Shumway, J. N. C., Taylorville, Ills.

Associate.

Buel, T. D., Detroit, Mich. Hobdell, Geo., Jr., Philadelphia, Pa.
Cruse, A. R., Philadelphia, Pa. Pratt, H., Chicago, Ills.
Gregory, G. H., New York City. Welcher, C. W., Chicago, Ills.

Vice-President Doty—You have heard the report of the Membership Committee. What is your pleasure?

Mr. McDonald—I move that the Secretary be instructed to cast the ballot of the Association for the gentlemen whose names have just been read. [Adopted.]

The Secretary—Mr. President, in accordance with the instructions of the members of the Western Gas Association present, I cast the unanimous vote for the names of the persons just read for membership in the Western Gas Association.

Vice President Doty—They are declared elected members, and are invited to participate in the proceedings.

A motion to adjourn until 2 P.M. was carried.

Vice-President Doty—The motion to adjourn for the noon recess having been agreed to I desire to say that as the first business of the afternoon is the report of the Memorial Committee, it is desired to have as full an attendance of the members as may be possible, in order that proper respect may be shown to the members who have passed away.

SECOND DAY—AFTERNOON SESSION.

The Association reassembled at 2:40 P.M., President Thwing in the Chair.

The President—Is the Committee on President's Address ready to report? We have in the order of business the report of the Library Committee. There seems to be some misunderstanding as to who constitute the Library Committee, and I would request the Secretary to report for the Committee.

REPORT OF LIBRARY COMMITTEE.

The Secretary—Mr. President, in accordance with the instruction of the Western Gas Association one year ago, I have on two occasions sent out lists of the volumes contained in the Library. The number of volumes loaned during the past year was 25. There have not been many acquisitions, and apparently not much interest is taken. I do not know what to suggest that would make the Library more available or more beneficial, except to announce that in the membership list you will see an index of the volumes contained therein, and should any member of the Association desire to borrow a volume he will observe the conditions under which it can be done. I can report no further than to refer you to the volumes contained in the Thompson Memorial Library, and to suggest that if any of you have volumes that you would like to give to the Association we would be glad to receive them.

The President—Have you got any data at all as to the number of volumes that have been borrowed?

The Secretary—Not with me.

The President—Can you give the approximate number?

The Secretary—Twenty-five. We have out now 11 volumes.

The President—It seems that this Library is not being used to the best advantage, or else that all members of the Western Association must have complete libraries of their own. It ought to be distinctly understood that this Library is for the use of the members of the Western Gas Association, and if you desire the use of any book contained in it all you are obliged to do is to write to the Secretary, who will furnish the volume to you free of cost. It seems to me the Library should be more used than it is.

On motion of Mr. Mitchell the report was received.

REPORT OF COMMITTEE ON PUBLICATION OF PROCEEDINGS.

The President—The next order of business is the report of the Memorial Committee, but I would prefer to have a larger attendance to listen thereto. We will take up the report of the Committee on Publication of Proceedings. This Committee, of which I am Chairman, would report that, owing to lack of matter—that is, not sufficient proceedings to justify the issuance of a volume of the "Proceedings"—nothing has been done in the past year, but it is expected that a volume of the Proceedings from 1902 to 1905, inclusive, will be published this year.

On motion the report was received and the Committee was ordered continued.

The President—Owing to the absence of Mr. W. B. Calkins, of Fairmont, Va., his paper on

COAL SAMPLING AND TESTING,

will be read by title only and then discussion on it will follow.

Mr. Calkin's paper is as follows:

The common rule expressed in most chemical and metallurgical text books in regard to sampling is that small amounts of the original mass shall be taken with such care that a representative sample is secured. But scarcely any information is given in regard to the number or amount of samples it is necessary to take in order to eliminate any possible chance of a slight error in one or more samples. This paper was not written with the idea of laying down any firm or fixed rule for sampling, but with the hope that those interested in establishing some general rule for sampling would take the matter up and determine for themselves the number of samples necessary to take, the amount to be taken and the method of preparation in order to bring the error to within a fixed or assumed basis. If this can be done and the co-operation of the Association secured, some common rule for sampling can be worked out and a fixed basis established, upon which all future tests can be made. The first few paragraphs of Prof. N. W. Lord's "Notes on Metallurgical Analysis" express tersely why it is necessary to exercise such great care in obtaining small impartial samples which shall truly represent the original mass. He says:

"The object sought by the technical analysis is to ascertain the average composition of some particular lot of material—for example, a carload of ore, an ingot of metal or a bin of coal.

"The amount of material treated in the laboratory is of necessity limited to a few grams. The preparation of this small portion so that its analysis shall correctly represent the composition of the mass from which it is taken constitutes the operation of sampling."

In sampling, as in any other kind of investigation, the person doing the work must know thoroughly what it is he wishes to learn, either of the character of the coal, of the quality of the coal, or of both. For character no sample need be taken, simply a specimen of the particular seam is all that is necessary. It has been found that there exists a remarkable uniformity of coal over large areas.

The character of the coal seems to depend more on geographical position and geological synclinals than it does upon its place in the geological scale. In other words, it is generally the case that all coals in a particular locality, no matter to what geological seam they may belong, are of the same character. A notable exception to this, however, is in the Kanawha field, where the splint, gas and cannel coals occur in close proximity. The character of a coal is indicative of its application in the industrial world. In the identification of a coal the proximate analysis is more important than any other test. The accurate determination of the volatile matter is of the greatest importance, followed closely by moisture.

Ash is of value only as an indication of the normal condition of sample or specimen in hand, but must never be overlooked, as a very high ash will affect the volatile matter to such an extent that the interpretation of the analysis will be very misleading. As an illustration of this point, let us examine the great beds of coal found in the Appalachian carboniferous series. Here we find the widest range or difference in character.

On the eastern extremity of the bituminous field you invariably find coals low in moisture and volatile matter; going westward, the volatile matter starting at about 12 per cent., increases regularly but gradually, with the moisture remaining constant until a maximum of about 40 per cent. volatile matter is reached. Evidently a bituminous coal cannot contain more than this amount of combustible volatile matter. In order to become more volatile, which they do at about the Ohio river, the coal must take on more moisture. This actually occurs, so that from the Ohio westward the volatile matter remains practically constant, while the moisture increases regularly and gradually as we move westward, until the maximum is reached at the western boundary of the coal basin, where it carries 7 to 8 per cent. of moisture.

The knowledge of these facts would indicate to the coal expert the probable location from which such specimens were taken. In determining the quality of coal, the science and knowledge of sampling play a very important part, for the small laboratory sample given the chemist must be taken and handled so carefully that it can truthfully be said to represent an average of the original mass. Knowing how difficult it is for two chemists, equally careful and skillful and employing the same methods, to obtain check results in proximate coal analysis, even when each man is furnished with part of the same well mixed finished sample, you can readily see how necessary it is that each man in collecting and preparing his own samples uses some method common to both, in number, amount and mode of handling, in order to eliminate as much as possible the error of the sample.

Anyone that has ever attempted to sample a large mass of coal is acquainted with the difficulties met with in obtaining a sample that will truly represent the original body of coal.

A large mass of coal is more or less a mechanical mixture of several

compounds or minerals, varying in size and specific gravity; for instance, the slate and bone coal may be in very small pieces intimately mixed with the fine coal or in flat, laminated layers running through the large lumps, or the pyrites may be present as large sulphur balls, or in very small layers or streaks throughout the coal seam. So the taking of a sample which shall contain the same proportion of coal, slate, bone coal and pyrites as does the original mass becomes a very hard matter and the greater the amount of impurities the coal may contain the greater the liability of error in the sample.

There are very few coals that have more than 5 or 6 per cent. of real ash in the normal coal, but admixtures of slate, bone coal, sulphur balls and foreign substances from the roof or floor of the mine raise the impurities and complicate the sample. So a knowledge of the original form of the coal will greatly assist the analyst in deciding to what extent the sampling must be carried.

It is necessary to determine not only the amount of impurities, but also to determine the probable error of any single determination, which in turn will tell how many samples are necessary to establish an average which will be within the allowable error, either fixed or assumed. In sampling coal no one method applicable to all cases can be carried out, but in sampling large exposed bodies of coal we hold that one large sample which requires some time to crush down and quarter allows too many chances for error, and the quality of the coal in the original body must be judged by the one analysis alone.

Whereas, if several small impartial samples had been taken from the pile, crushed and quartered down rapidly, which their small size would have permitted, and a separate analysis made on each one, the average of all the analyses would have represented more nearly the composition of the mass of coal than the analysis obtained from the single sample. This has been proven by a series of tests carried out under the direction of Mr. Frank Haas, chief of the testing department of the Fairmont Coal Company. For example, from a large pile 100 small impartial samples of coal were carefully taken and analyzed. Using the per cent. of sulphur for illustration the average of the 100 sulphur determinations were assumed to represent exactly the composition of the coal pile. Now if the analyses are taken in blocks of 10, starting with 1st, 10th, 20th; 2d, 11th, 21st; 3d, 12th, 22d, and so on, and the average of these blocks taken, in like manner blocks of 12, 15, 20 and 25 taken and the average obtained for each block of samples, a curve can be plotted, which will show at a glance how many samples must be taken in order to reduce the error to the allowable limit.

By this means we found that 20 samples must be taken in order to reduce the error to .10 per cent. or better. Of course, the personal factor of the analyst comes in, but by reducing the error on the sample we reduce the entire probable error.

If after determining the number of samples it is necessary to take in order to limit the error, the time and expense necessary to analyze each sample, are objectionable, a composite sample can be made by taking an equal part of each sample and thoroughly mixing. Using this sample for the laboratory analysis, results very close to the general average can be obtained.

In boiler testing the rules for coal sampling, as specified by the American Society of Mechanical Engineers, are about as follows:

One representative shovel full of coal is taken from each barrow load, placed in some air tight, covered receptacle at some distance from the heat of the furnace and in a cool place.

At the end of the test the large sample is crushed and quartered down in the usual manner for the laboratory analysis. This method of sampling gives only one large sample and the same objection applies in this case as before. If each one of the shovelsful had been taken as a separate sample perhaps some of the unaccounted-for losses could have been itemized in another place. The sampling of a coal mine pre ents another problem, but one which is comparatively easy if the rules and directions here given are followed closely.

Examine carefully the map of the mine and determine the location of points from which samples can be taken that will fairly represent the quality of the coal. Before sampling make a cut from the roof to floor of the seam, exposing a fresh surface of coal, unaffected by weathering or sulphur and smoke from the blasting powder. Clean the floor and spread a large piece of clean canvas or oilcloth to catch the cuttings. Then with a small sharp pick or chisel cut a channel in the face of the coal from floor to roof, the channel to be from 2½ to 3 inches wide and 1 to 2 inches deep. Do not cut out slate, bone coal or other impurities that it is the practice of the mine to reject. Place each sample in a stout canvas bag if it is to be analyzed at once, otherwise crush and quarter down the sample at once and place in a large air tight bottle or jar. The larger the mine and thicker the seam the more samples it is necessary to take in order to represent the quality of the coal.

As ash and sulphur are the only variables in samples of coal taken from a uniform seam, and since these have been known to vary from 10 to 50 per cent. in different parts of the seam, a complete analysis of each sample is necessary. The average of all the analysis will represent the "run of mine" from the entire seam.

By analyzing each sample separately the high and low ash and sulphur points are located and the coal can so be mined as to fit it for the purpose for which it is to be used. The actual operation of preparing the sample for analysis consists in crushing, mixing and quartering until about 100 grams remain, which is put through an 80-mesh sieve and placed in a small, air tight receiver.

With small samples this operation can be carried on very rapidly without any appreciable loss of moisture through air drying, thus avoiding the loss of time and extra calculations necessary when handling large samples which must be air dried for 24 hours or longer and the loss of weight figuring in the per cent. of moisture found by analysis.

The test of the coal that can be made in the laboratory consists in the proximate analysis, the ultimate analysis, the determination of the per cent. of the sulphur and phosphorus and the calorific value of the coal either by calculation from the results of the ultimate analysis or by the use of some standard calorimeter.

Laboratory test can also be made on the coking power of the coal, the effect of washing on coal and the porosity of the coke. As previously stated, the proximate analysis is the most important test that can be applied in identifying the character of a coal or determining its quality.

The method universally adopted is that reported by the Committee on Coal Analysis of the American Chemical Society, and is too well known to be commented on here except to remark that it must be strictly followed, as any departure will lead to much variation in results on moisture, volatile matter and fixed carbon. In a laboratory where much work is done along this line and a large number of platinum and porcelain crucibles are available, a small gas or gasoline muffle furnace holding 10 to 20 crucibles will hasten and facilitate the analysis greatly.

For the determination of sulphur either Eschka's or the sodium peroxide combustion method is equally good. Where only a few coals are to be tested for sulphur, the sodium peroxide method is undoubtedly the most rapid, also the most expensive. For the ultimate analysis and other laboratory test any standard book on quantitative chemical analysis will give all the information necessary.

For work of this kind I have found Prof. N. W. Lord's "Notes on Metallurgical Analysis" to be of very great help. The notes and methods contained therein having all been tested over and over again, are rapid, practical, easy of manipulation and giving accurate results when properly handled.

I wish to thank Mr. Frank Haas, Chief of the Fairmont Coal Company's testing department, for assistance and information given in the preparation of these notes.

Discussion.

Mr. Berkley—It has lately been brought to my attention, and I think to that of others, that there is a lack of interest, that there is a lull. Having attended these several meetings, and observing the interest that is manifested in them, the evidence of which we see just now, when we are trying to get a body of our assembly together in order to hear the memorials to our members who have departed during the year, we find our President constrained to hold off until more members are upon the floor. That is only an indication of the actual condition into which we as men of this Association are drifting. I say it with all kindness and candor, that if our success is to be true success it must be through diligence to the business of this Association at its called sessions, to press forward in its work, to prosecute with vigor all of its interests. Instead of being characterized, as I have heard some characterize us lately, a little bit slow, instead of having it said that others are gaining ground where we are losing ground; but on the other hand, may it be said that the Western is the most progressive, the most alive, up-to-date, thorough-going Gas Association in this country. There is no reason why, gentlemen, these meetings should not be better patronized by our presence. Such a paper as Mr. Wheeler's that we have heard read here this morning is indicative of the condition in which we find ourselves, because we are unable—and I feel my inability along with the rest—to enter into an intelligent discussion of a paper that leads and throws light upon the gas industry. There is no use in our thinking or

talking that our business is good enough and that our members are up to the standard. Opportunities are being made, avenues are being opened, and the result of it is that unless we as men take the opportunity by the horns and are equal to the dilemma in which we actually find ourselves placed, which is really dangerous ground, we will in time—not this year—be submerged and absorbed by some other power that is stronger than ourselves. We have some of us come many miles, some of us a short distance. If we will consider the interest which we represent the time allotted to the representation is short. With our action and energy devoted to it we would then accomplish much more than we accomplish because of our indifference. I know no other word that expresses it or that indicates anything of the sort which I wish to describe; it is simply indifference to attending sharply and promptly to business. On the other hand, we represent here men of salary, men of brains, whose time is worth something. If that is true, we should with pride and pleasure and profit come and sit and listen to what they have to say. It is a shame, my friends, that men will sit down and write papers and study hard to give us something which we ourselves don't know, and then they will come here and the papers will be treated as we have treated the papers here this morning. I would have you bear in mind that this criticism I am offering to our Association as a body is from the kindest intention and the best spirit of brotherly feeling, for we are on dangerous ground, in danger of losing what we once had, the greatest prestige, or what we still have and can maintain, the integrity of the Western Gas Association beyond any impressionable power that might be brought against it. Therefore, I respectfully ask, on behalf of the Association and as a member of it, that we prosecute with diligence the business that is here for us to do. Next year, when we come to the meeting, let us see that the printed matter is sent out earlier, that men are better posted on the subjects for discussion, and when we come here let us come to the business as we go to business at our several places. We would not hold our positions very long, we would not succeed very far, if we neglected our business like we neglect the sessions of this Association. So let us now make a resolve that next year, when the President calls the meeting to order, we will be on the floor and take an active part, and that we will go away from here benefited morally, financially and spiritually, and through brotherly love and every other way that will lift us up. I thank you very much. (Applause.)

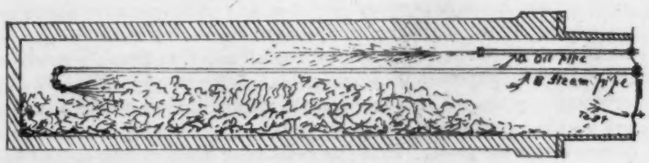
(To be Continued.)

[Prepared for the JOURNAL.]

An Apparatus for Quick Enriching.

By MR. H. B. JOHNSON, New Decatur, Ala.

Set up a large range boiler in a convenient place where the oil can be safely handled. Take out the two connections on top of the tank, using one of the holes thus made for filling and the other for the pipe connection to the air pump, using a stopcock at the pump connection. Connect a ¾-inch pipe for the oil to the bottom of the tank, extending it over and in front of the bench, about 6 feet above the middle retorts, using a valve at the tank. Run a ¾-inch pipe for steam to within about 5 inches of the oil pipe in front of the bench. Then bore 2 holes in the retort lid and tap for a ¾-inch. Make these holes about 5 inches apart and near the top of the lid. Use a piece of pipe about 3 feet 6 inches in length and cut a long running thread to enter the lid, using lock



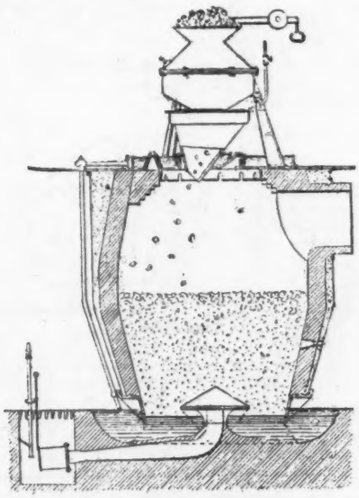
nuts at its entrance and exit from the lid, and at the retort end place a cap containing a hole about $\frac{1}{16}$-inch or $\frac{3}{32}$-inch in diameter. Then connect a steam pipe in the same manner, extending to within about 8 inches of the back end of the retort, making a return bend at the end of this pipe, and capping with a cap containing a ¼-inch hole. Bore a third hole in the lid and put in a cock so that the gas may be tested during the operation.

When ready for use, take a well-baked charge, level it off and make a pocket with the coke hook at the rear and to allow the steam pipe to drop in, fill the tank to within about 12 inches of the top, pump up the pressure and connect the pipes.

The use of the test cock determines the proportion of oil and steam. After the operation there is not the usual accumulation of soot in evidence.

Notes on Three Producers: The Morgan, Letombe and Hovine-Breuille.[1]

The Morgan Producer.—Three gas producer papers were presented to the recent meeting of the Société Technique du Gaz. The first was by M. Thelliez, who described the application of the Morgan producer to the manufacture of gas for heating retorts. The author thinks that in every regenerative setting of retorts there is always insufficient room for recuperation so as to allow it to have the space and power that it ought to have. Thus arises the idea of separating the producer from the bench itself. This idea, up to the present, however, has not led to great results, because a large amount of heat has been lost; and if the change has been adopted only with a view to the better recuperation, there has been no great economy.



The Morgan Producer.

A new producer, known as the Morgan, which is derived from the Wilson producer, has the advantage of almost entirely doing away with labor, and can also be fed with the poorest fuel, such as sweepings, waste and dust from washing, etc. The Morgan producer consists of a sheet iron cylinder, narrowed towards its base, and furnished inside with a refractory lining. Two sizes have been adopted, both 3.50 m. (nearly 11 feet 6 inches) high. The first type is 3.05 m. (10 feet) outside diameter, and consumes 7 metric tons of fuel per 24 hours. The second type is 3.65 m. (nearly 12 feet) diameter, and consumes 12 tons. In the center at the top of the producer is an automatic distributing apparatus, which continuously spreads the coal equally over the whole surface. If there are a good number of producers to be supplied, the coal is fed mechanically into a primary receptacle, whence it goes into a funnel, worked by a rotary motion round an arc. The coal is scattered, piece by piece without interruption, always leaving a level fuel bed. A double hydraulic joint at the top prevents communication between the producer and the outside air. In producers of other systems a large quantity of coal is charged from time to time, which results in an immediate and superabundant supply of gas, rich in carbon and tar. Then follows a period of quiet, during which good gas is obtained, but the quantity of which does not fall off until it becomes necessary to make a second charge.

The regular distribution of coal has the advantage that the air and steam traversing the mass always meet the same resistance (which means regular and complete distillation); whereas in other producers the air and steam pass with difficulty through uneven heaps, whence arise irregularities, excess of carbonic acid, large clinker, and loss of fuel. The whole base of the Morgan producer is plunged in a water tank; and in the middle at the bottom, under a conical hood, is the blow pipe which receives the mixture of steam and air. This mixture can be regulated as desired, which is a great advantage, because the regulation can thus be affected so as exactly to meet the needs of different kinds of fuel. By this special but simple arrangement, the distribution of air and gas is effected equally over the whole surface; the per-

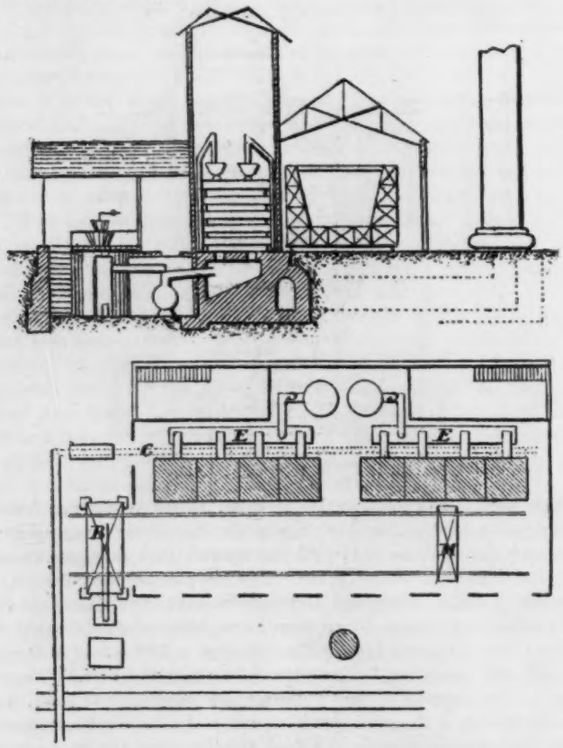
1. *Journal of Gas Lighting.*

ous ashes and clinker suck up the water and give up all their heat to the rising gas; the most caked clinker becomes split up, and can be drawn out as easily as the ash, without the producer itself feeling the slightest shock; also the biggest clinker can be taken out without the least inconvenience.

Tests of the Morgan producers show that they can use very poor coals, even containing up to 70 per cent. of ash. The average analysis of the gas from ordinary coal gives:

Carbonic acid	4.0	per cent.
Carbonic oxide	25.5	"
Light carburetted hydrogen	3.9	"
Olefiant gas	2.1	"
Hydrogen	17.8	"
Nitrogen	46.7	"
	100.0	

In general, the gas produced contains 88 per cent. of the calorific capacity of the coal used. The production of carbonic acid never goes beyond 1.5 per cent, and the amount of fuel still contained in the residue does not exceed 1 per cent. To sum up, the Morgan producer offers three great advantages:



The Morgan Producer Adapted to Retort House Use.

1. Absolute regularity in working; always equal production of the same gas, without shocks and interruption; great freedom in power controlled as desired with a given pressure, and hence maximum yield in calories.

2. Hardly any labor.

3. Possibility of using the most variable and least valuable fuel, because in many cases the calorific value of fuel is far from being in proportion to its real commercial value.

One Morgan producer could be adopted for a set of 4 beds, or one producer to 44 retorts, 3.50 m. (11 feet 6 inches) long. The elasticity of the apparatus would enable the production to be varied according to the lighting up or letting down of the beds. An installation (as illustrated) with two producers and plant to carbonize 80 (metric) tons of coal per 24 hours, would make 24,000 cubic meters (847,600 cubic feet) of gas, and would require two squads of men, each consisting of a machinist, two stokers for retort lids and ascension pipes, one fireman; total, 4 men.

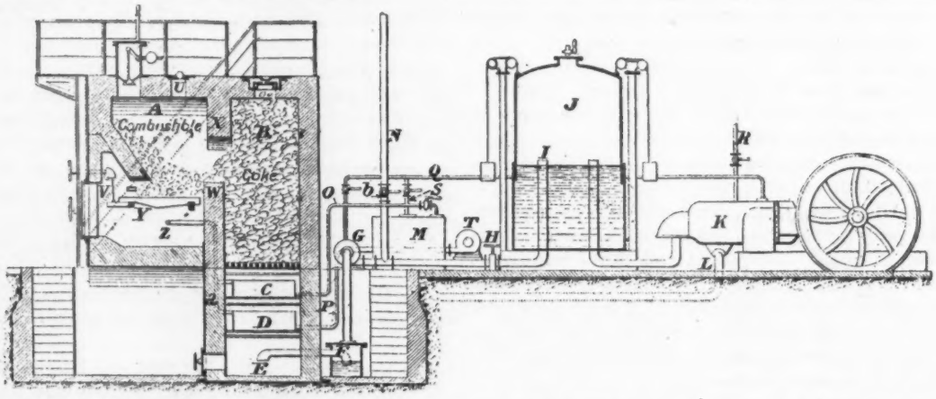
The Lille plant showed where modifications had to be made; firstly, in having sets of 4 or 5 beds, and secondly, in doing away with a single roof to cover the beds and machines. Beds of gas retorts can never be too free from above, so hard is the work of the pipe jumpers. Directly one tries to avoid labor and to facilitate working, a special form of construction becomes imperative. Such a design is shown in the illustration, and consists in covering only the bench with a very high roof, thus forming a sort of chimney, and allowing the men to clean and burn out the ascension pipes without being inconvenienced by the clouds of smoke arising therefrom. On the right is a very light roof just to cover the machines, and on the left a shed, or lean-to, for the producers.

The Letombe Producer.—The second gas producer paper was merely a page of figures compiled by M. Coze, giving the results of 11 tests of the Letombe producer. The fuel used was very small and medium coke, and the average calorific power per cubic meter of gas at 0° C. and 760 mm. was 1,104 kilo-calories with steam condensed, and 1,073 kilo-calories with steam uncondensed. The average composition of 1 cm. or 1,000 liters of the gas was: Carbonic oxide, 290 liters; carbonic acid, 40 liters; hydrogen, 70 liters; oxygen, 0 liter; nitrogen, 600 liters—total, 1,000 liters.

The Hovine Breuillé Producer.—The third paper was one in which M. Hovine himself described the Hovine-Breuillé producer, using as fuel, coke, waste or coke dust. M. Hovine may also be remembered as part designer of a system of producer and regenerative furnace specially intended for heating retorts in works where it is desired to use coke breeze as fuel. He says in his paper that coke and its derivatives are too abundant by-products in gas works for it to be possible to sell them at their real calorific value. There is, therefore, every reason to develop their being utilized on, and for the need of the works themselves, so as to avoid lowering the sale price.

This has affected to some extent the question of the economical heating of retorts, and has also led to the adoption of water gas, which has partly utilized the coke and reduced the amount that would otherwise have been made by coal carbonization. Further, the extension of mechanical appliances, the establishing in gas works of electrical stations, either for lighting or driving purposes, and, in short, all demands for power, have opened up a new and advantageous market for gas coke. To use it, however, is not so simple as it looks. Boilers are costly, bulky and cumbersome; their power is limited by the quantity of coke consumed; and if used directly under the boilers, the yield in steam is only moderate, and the regulation of the fire rather delicate, especially with breeze. The use of coke in a producer is economically much to be preferred; the cost in fuel per horse power hour falling from 1,000 or 1,200 grammes (2.2 or 2.6 pounds) with steam to 500 or 600 grammes (1.1 or 1.3 pounds) with producer gas. The apparatus is simple, and the working easy when the fuel is good like English anthracite or metallurgical coke. But with some coke and thin coals, difficulties come about from clinker; and, in spite of frequent raking out, the zone of combustion rises, and after two or three days the producer has to be completely cleaned out. These experiences led M. Hovine to study the question, and last year, at the Exposition du Nord de la France, at Arras, he was able to show a Hovine-Breuillé producer supplying a 100-horse power gas engine with poor gas.

A coal producer, using coke and dust, although all right for gas for heating purposes of 900 calories per cubic meter, is unable to produce gas of 1,050 or 1,200 calories necessary for an average gas engine with poor gas. If we shut the ash box and blow dry steam and air at 200° or 300° C. under the grate of this producer, the gas obtained will be good enough for the engine. But if the fuel on the grate bars is full of ashes, unequal in size, small or powdery, the thickness of the fuel bed will cease to be uniform, passages will be formed, and the gas will be of bad quality. All this is easily remedied when the producer is not being blown, but is impracticable if it is, and under pressure above the grate bars. It is necessary, therefore, while driving back the gas obtained under 8 to 10 cm. (3¼ to 4 inches) of water, to keep the producer chamber at atmospheric pressure. This is very simply effected by interposing between the producer and the regulating gas holder a suction and blowing ventilator, the working of which is conjoined with the blower under the grate. Thus the clinkering holes can be opened and the producer seen and worked without any escape of gas or inlet of air. A regulating column of coke placed at the back of the producer and traversed by the gas, keeps up a good bed of fuel in case of the attendants' negligence. The purity, size, or character of the fuel is, under such conditions, of little importance, and excellent gas has been obtained from fuel with 65 per cent. of ash. Some fuel, called "refuse of the coke fork," consisting of 17 per cent. of small coke, 25 per cent. of very small coke, 25 per cent. of small dust, and 33 per cent. of fine dust, gave very interesting results as regards the facility with which the producer worked, the regularity of the gas produced, and the low expense per horse power hour with such a low grade fuel. A 75-horse power producer gave effective work of 80-horse power per hour; the



A Producer.
B Regulating chamber.
C Steam superheater.
D Air heater.
E Gas outlet.
F Hydraulic joint.
G Suction ventilator.
H Gasholder valve.
I Gasholder inlet.
J Gasholder.
K Engine.
L Exhaust gases from engine.
M Boiler.
N Outlet to open air.
O Steam piping.
P Air piping.
Q Hot water piping.
R Cold water inlet to engine.
S Hot water inlet to boiler.
T Blower.
U Fire pricking hole.
V Grate motion.
W Fire bridge.
X Partition.
Y Special swing grate.
Z Steam inlet under grate.
a Hot air inlet under grate.
b Outlet valve to open air.

The Hovine-Breuile Producer and Accessory Apparatus.

gross weight per horse hour being 837 grammes (1.84 pounds), and the calorific power of the gas 1,152 calories. With ordinary coke from the Arras Gas Works, a producer of 100-horse power gave effective work of 105-horse power per hour, a gross weight of coke per horse power of 600 grammes (1.32 pounds), and a calorific power of 1,120 calories per cubic meter of gas.

The accompanying diagram of the Hovine-Breuillé producer and arrangement will explain itself. It may be added that M. Hovine had hoped to submit this producer for official testing by the Société Techniqae du Gaz before this year's meeting, but time did not allow, and the trial of it is therefore postponed until next year.

External Causes of Sparking in Direct-Current Machinery.

[By SYDNEY WOODFIELD, in *Electrical Review*.]

The following article deals with the sparking in direct-current machinery, due to external causes; that is to say, due in no way to defective design. As a rule, a small amount of sparking for a short time is not detrimental, but owing to the roughening caused to the commutator the effect is cumulative, and it becomes, therefore, necessary to eliminate the cause of the sparking as soon as possible. White sparks are generally small incandescent particles of carbon torn from the brushes by a rough commutator, while bluish-green sparks indicate that damage is being done to the commutator segments.

In railway motors, owing to their reversibility, the brushes must be fixed permanently at the neutral point, and the field cannot be utilized for reversing the current in the short circuited coil; the commutation is, therefore, hardly ever sparkless at full rated load, and the commutator needs considerably more attention than is required for an ordinary unidirectional motor. It has been found that hard crystalline brushes (which have a lower contact resistance and lower coefficient of friction), soaked in hot liquid vaseline, give excellent results.

The following are the more common causes of sparking: (1) Dirty commutator; (2) weak field; (3) excessive overload; (4) vibration; (5) incorrect location of brushes; (6) unbalanced magnetic circuit; (7) defective commutator or armature.

1. This is perhaps one of the most common causes of sparking troubles, and is generally due to the oil wells being allowed to overflow. The carbonized oil, with probably steel dust from the bearings, copper dust from the commutator aad carbon from the brushes, forms a plastic mass which makes sparkless commutation impossible. Moreover, it forms a conducting medium between commutator bars, which can readily be seen by a number of sparks between bars. Finally, this conducing medium will form a short circuit from positive to negative brush. This dirty condition will also cause considerable heating of the brushes and commutator, and the heating may rise to such an extent as to cause damage to the insulation of the machine. In larger machines operated by cross compound engines oil on the generator is fairly general, owing to the splash from the eccentrics. Great care should, therefore, be paid to the oil guards, which require to be of solid construction owing to the suction caused by modern methods of ventilating armatures. To remove the oil, etc., the commutator should be cleaned with a rag soaked in benzine, and afterwards wiped over with a clean, dry rag, a little vaseline being used for lubrication.

In a new machine, after the brushes have been bedded down by drawing a piece of sandpaper backwards and forwards face upwards between the commutator and the brushes, the commutator should be cleaned up with a clean rag dipped in paraffine, until it no longer picks up further carbon dust, and then thoroughly wiped over with a clean, dry rag. It is always advisable to run a new machine without load for some time, in order to allow the brushes to wear down and make good contact, as good commutation cannot be expected unless at least 75 to 80 per cent. of the brush surface is in contact. Sparking may also be caused by the brushes not sliding freely in the boxes. If the sides of the brushes are rough, they should be sandpapered, and the inside of the boxes should be wiped out with benzine to prevent sticking. The brush holders should be staggered on the studs so as not to wear grooves in the commutator. In rotary converters, an end play device is usually supplied, which constantly oscillates the armature backwards and forwards. The Bullock Company, in its engine type generators, provides a mechanism for slowly carrying the whole brush rigging on trunnions backwards and forwards lengthwise on the commutator to prevent grooves forming. This also prevents any particular spot from aggravating the same brush or brushes, and it is usually found that the movement of the brushes removes the spot that causes the trouble.

Care should be taken to see that the springs bear on the center line of the brushes and that all the brush tips are in a straight line. It may sometimes happen that sparkless commutation cannot be obtained in any location. Alternate brushes on each stud should, if possible, be set about one bar in advance (this is equivalent to increasing the width of the brushes); sparkless running will then generally be obtained. Most modern machines have two or more brushes per stud, which can move independently. In some of the earlier machines only one brush per stud was provided, and, consequently, the slightest irregularity would cause excessive sparking.

2. A weak field is often caused in a new machine by one of the field spools being reversed; this will cause bad sparking. The polarity may be tested with a compass needle, or, if this is not handy, a small piece of iron may be held across the tips of adjacent poles; when these are of opposite polarity, the iron will be held strongly and will take considerable force to remove it, whereas, if they are of the same polarity, the pull will be almost negligible.

Akin to the above is connecting the series winding in opposition to the shunt windings; in a generator this may easily be detected by the fall in pressure as the load comes on. This fall will be considerably more than if the machine were a purely shunt wound one, whereas if the winding were connected correctly, the voltage would, of course, rise. In a motor which is designed to be similarly wound, the speed will rise if the series winding is connected in the reverse direction, whereas if it is connected to act with the shunt field, the speed will

drop more than on a shunt motor. In a differentially wound motor the speed should remain practically constant for all loads.

An internal short circuit in one of the field spools will also cause a weakened field, since a portion of the turns are cut out. This will generally be detected by that particular spool being cooler than the rest, or by taking the potential drop across each spool by means of a volt meter. The drop across the defective spool will be less than across the others. It is obvious that owing to the unequal field strengths under different poles, sparking will ensue. Sometimes the connections between spools are not properly tightened up and vibration causes the wire to fall out, thus breaking the field circuit and causing considerable damage. The screws should be firmly driven and a spot of solder dropped on to prevent them from becoming slack. Many motors have to run on grounded circuits; care should therefore be taken with the insulation, especially between the shunt and series winding, since it has to stand the full voltage of the circuit at starting.

Unequal field strength under the poles may also be caused by not bolting up the poles or pole shoes tightly; this fault, however, will usually be found when centering up the armature, but all joint surfaces should be carefully cleaned and, except in the case of electrical ones, coated with a thin layer of oil, special care being taken with the pole pieces and halves of the magnet frame.

Low applied voltage in the case of a motor will cause sparking if the drop in voltage is serious; moreover, as the makers usually have only one field winding for fairly wide limits, rating the speed up or down about half way in proportion to the increase or decrease (as low voltage on fields tends to increase the speed and on armature to decrease the speed, and vice versa) in voltage, it often happens that one may get as much as 20 per cent. low voltage on the machine and at the same time expect to get full rated load from it without sparking.

In a generator the poor regulation of the governor causing a falling off in speed gives a low voltage and, consequently, a lower density in the air gap; this, as above, causes sparking owing to the neutral point shifting. Shunting the fields of series wound motors so as to give a higher speed is now rarely used, although it was quite common with railway motors at one time, but considerable sparking was caused by its use when going up hill, for which purpose it was never intended. On a grounded circuit a short circuit to ground of one of the field spools will weaken the field. This fault is quickly located if the grounded coil is near the line side as the spools in circuit will get excessively hot; if near the earth side, the same test as for a shorted coil should be applied.

3. Excessive overload on a machine, whether generator or motor, will cause sparking. As is well known, the coil under commutation must be in a field of such strength as to generate an EMF. equal in value but opposite in direction to the EMF. of self induction produced by the reversal of current in the coil. As a larger current is drawn from the machine, it is clear that a more intense field is required, but this larger current produces an armature flux which distorts the field and makes it lead the brush position and at the same time it also weakens the field, hence the brushes must be given a further lead until ultimately a current will be reached such that sparkless commutation is impossible. Modern machines allow considerable latitude in the location of the brushes for a definite load, hence, under normal conditions, the brushes are set fairly well forward, so that when an overload comes on there will be very little sparking, but should the overload still be increased, it will be impossible to prevent it. Care must be taken, however, to guard against too much forward lead, since, should the station circuit breakers open, the machine would spark badly at no load or might even flash over.

The current density in carbon brushes should not exceed 30 amperes per square inch at full load and the tension about 2 pounds per square inch. A greater pressure will cause a considerable increase in brush friction and consequently heating, besides undue wear on brushes and commutator. It, furthermore, leads to glowing and selective commutation. A heavy overload or short circuit on a shunt wound generator or motor obviously acts as a low resistance shunt to the field winding and, therefore, the machine loses its field. In a generator, this will automatically relieve the machine, but in a motor, if not efficiently protected, it would result in a burnt out armature. Care should be exercised in selecting a motor for certain machine tools, etc. Whenever the load is at all intermittent, a compound wound motor is preferable; for instance, circular saws, pumps of the bucket type, air and ammonia compressors, etc., as if a shunt machine is used there is sure to be trouble from sparking. This matter is, however, governed somewhat by the design of machine, and the material of the magnetic circuit. A material possessing great coercive force is, perhaps, preferable.

[To be Concluded.]

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

THE coal and coke bins of the Fort Madison (Ia.) Gas Light Company took fire the morning of July 10th, presumably from spontaneous combustion, which resulted in a loss of about $3,000 worth of property. The loss is fully covered by insurance. There was no interruption to the gas supply, and in a short time when the repairs have been completed the property will be in better condition than ever.

AT the annual meeting of the Fulton County Gas and Electric Company, which was held some days ago in the home offices, Johnstown, N. Y., the officers named were: President, A. M. Young; Secretary and Treasurer, Lewis Lillie; Agent, Captain L. D. Spragle.

THE Massachusetts Board of Gas and Electric Light Commissioners has authorized the Malden and Melrose Gas Light Company to add 2,025 shares to its capital stock, at an upset price of $120 per share, the proceeds from the sale of 1,500 shares to be used in taking up the Company's floating debt, the proceeds from the remaining 525 shares to be devoted to the payment for additional plant, subsequent to May 1, 1905.

THE Commission also authorized the Worcester County Gas Company to put on the market an original capital of 850 shares, at $100 per share, to pay the floating debt incurred in the construction of the plant, prior to January 1, 1905.

A CORRESPONDENT in Bridgeport, Conn., incloses the following under date of the 15th inst: "Mr. Francis B. Sammis, formerly Secretary and Treasurer of the Bridgeport Gas Light Company, died at La Jolia, Cal., the 10th inst, after a lingering illness. He removed from this city to California 2 years ago, owing to failing health following an attack of grip. Mr. Sammis was born in South Norwalk, Conn., 54 years ago and came to Bridgeport to act as assistant ticket agent at the depot of the New York, New Haven and Hartford Railway. Later on he went to Waterbury, Conn., and then became identified with the Bridgeport Gas Light Company, in the service of which he remained 15 years. He is survived by his wife, a son and a daughter."

ON August 3d application will be made to the Governor of Pennsylvania by York capitalists for charters for 4 new gas companies, to be located in North York borough, West York borough, West Manchester township and Spring Garden township. The incorporators in each Company are Messrs. Grier Hersh, George S. Billmeyer, E. K. McConkey, Henry Ness, Charles Hurtz, George Small and John C. Schmidt, all of whom are interested in the York Gas Company.

MR. L. L. KELLOGG, General Manager for the Sioux City (Ia.) Gas and Electric Company, on the 11th inst., sent to the City Clerk a draft for $2,843 37, representing 2 per cent. on the gross receipts of the Company for the past 6 months, which sum goes into the city treasury, and represents the royalties on gas sales as per the franchise agreement that went into effect some years ago.

MR. C. W. KOINER has resigned the presidency of the Madison County Gas and Electric Company, of Oneida, N. Y., in order to accept an important position on the staff of the National Lighting and Improvement Company, of St. Louis.

THE annual meeting of the Bridgeton (N.J.) Gas Company resulted in the following official selections: Directors, B. H. Minch, Wm. C Mulford, James W. Trenchard, David P. Mulford and Barton F. Sharp; President, B. H. Minch; Secretary, William C. Mulford; Treasurer and Superintendent, Benjamin F. Harding. This outcome marks the 33d consecutive election of Mr. Harding as Superintendent. The Directors paid the Superintendent a splendid compliment in their hearty congratulations upon his successful service and excellent administration of the affairs of the corporation covering one-third of a century.

THE Kansas City, Missouri, Gas Company some days ago sent a check for $11,046.72 to the City Comptroller of Kansas City, which sum represented 2 per cent. on the gross earnings of the Company for the six months ended June 30th.

BY a vote of 13 to 7 the Lower Board of the General Council of Louisville, at a meeting held the night of the 12th inst., rejected the

ordinance providing for the sale of 6,000 of the 9,250 shares held by the city in the stock of the Louisville Gas Company. The correspondent who forwards this information adds: "While the vote was not clinched, so that the ordinance cannot be brought up again for one year, it is probable that no effort will be made to have it reconsidered during the life of the present Lower Board. The action of the Board was in the nature of a surprise, for it was thought that no vote would be reached at that sitting."

A CORRESPONDENT in Savannah, Ga., writing under date of the 14th inst., says: "The City Council of Valdosta, Ga., has granted a franchise for the erection of a gas plant here, and the Company to operate the enterprise has been formed with a capital of $50,000. The officers of the Company, all of whom are residents of Tallahassee, Fla., are: President, W. C. Lewis; Secretary, F. W. Armstrong; General Superintendent, C. R. Miller.

THE piping of the streets in Metuchen, N. J., by the Metuchen Gas Light Company, will be completed by September 1st.

MR. GEORGE MATT, proprietor of the Lancaster (O.) Gas Light and Coke Company, announces that the plant will be closed down, July 31st; cause, too much natural gas. Mr. Matt proposes to continue the business of the Lancaster Electric Light Company, which property is under his control.

"F. S. R." is informed that the Company which proposes to supply gas in Suffolk, Va., is of the acetylene type, and that the plant is being installed by the Home Acetylene Gas Company, of Lynchburg, Va.

AT a meeting of the Common Council, of Alexandria, Va., the proposition to put the selling rate for gas in that city at $1 per 1,000 was defeated.

AT the annual meeting of the shareholders in the Southbridge (Mass.) Gas and Electric Company the officers chosen were: Directors, H. C Cady, C. D. Page, H. C. Walls, John M. Cockran, John A. Hall, Geo. N. Corey and Andrew F. Hall; Clerk, Albert D. White; Treasurer, Geo. N. Corey. It was decided to reduce the selling rate from $2.25 to $2 per 1,000 cubic feet, the concession to take effect at once.

A CORRESPONDENT in Providence, R. I., writing under date of the 16th inst., incloses the following: "A matter of much interest to every resident of Pawtucket, and one which the City Council shows no inclination to consider, is the proposition submitted by the Pawtucket Gas Company last December for an exclusive franchise and a material reduction of rates to the consumers. The continued refusal of the city officials to grant this franchise and thereby give the residents a cheaper gas rate has been strongly criticized. The question is not a new one and over a year ago was thoroughly threshed out. At that time the Gas Company became weary of the unbusinesslike methods which prevailed in the City Council and withdrew the request. Last December it presented a second proposition which was of a far more satisfactory nature and which all who have studied the matter admit is just to both city and consumers. The Company requests an exclusive franchise for a period of 15 years, and in return is willing to concede a material reduction in the price of gas. All the privileges and rights of an exclusive franchise are now enjoyed and the city in reality grants nothing more than is now possessed. The matter was referred to the Committee on Street Lights of the incoming Council last January and the members of this sub-body have had 6½ months to investigate and report. The Gas Company is entitled to either a refusal or a grant of its request within 6 months, it would seem. Something over a month ago the Pawtucket Merchants Association, the members of which, it is common knowledge, know far more about conditions relative to matters of lighting in other cities than do the city officials, petitioned the Council to grant the proposition. The communication was received in the Board of Aldermen and referred to the Committee on Street Lights without any comment, where it now quietly reposes with the original request of the Gas Company. The Company does not seem to be particularly anxious to receive the franchise, as the reduction in the rates means a large decrease in its receipts. It is the consumers who desire to see the reduction, and at the hearing which was held months ago there was an almost unanimous sentiment in favor of granting favorable consideration. The members of the Merchants Association have made a thorough study and investigation of conditions, prices and franchises in cities of the same approximate size as Pawtucket, and after months of work and discussion unanimously indorsed the proposal submitted by the Company."

MR. W. H. COULTER has succeeded Mr. Frank Eager as Manager of the gas plant at Litchfield, Ills.

THE thoroughly modern and up-to-date gas plant recently constructed by the proprietors of the Key City Gas Company, of Dubuque, Ia., is in satisfactory operation. No hitch whatever occurred at its starting."

THE Amalgamated Gas Fixture Company, to carry on the manufacture of gas and electric fixtures in New York, with a capital of $45,000, has been incorporated by Messrs. R. B. Aiken, Bernard Gobel and Jacob Donaldson.

MESSRS. BARKER and George, of the Massachusetts State Board of Gas and Electric Light Commissioners, accompanied by Mr. J. E. Cotter, of Hyde Park, Mass., sail for Europe the 1st prox., per steamship Ivernia. They make the journey with the express purpose of observing the operation of the London sliding scale system of gas rates. They expect to be absent 5 weeks, and on their return will apply the same methods to the solution of the problem which the consolidation of the Brookline and Boston Gas Companies will present for their consideration.

MESSRS. GEORGE A. SNOW and William Darst have petitioned the City Council of Salt Lake City, Utah, for a franchise permitting them to manufacture and distribute gas in that city. The main points in the opposition scheme (for that is what it really is pure and simple) are that the promoters are to have the use of the streets and alleys for pipe-laying purposes for a term of 50 years; it fixes the prices at 80 cents for gas sold on fuel account, and at $1.25 for an illuminating supply, prompt payment on either account (within 10 days) to obtain for the user a rebate of 10 cents per 1,000; the petitioners agree to begin work within 6 months from the issuance of the franchise, to lay 20 miles of pipe within 2 years, and 10 miles a year for the succeeding 2 years. For 5 years after the expiration of the first 2 years following the granting of the franchise, the petitioners agree to pay from the gross revenues of the corporation 1 per cent.; for the next 5 years, 1¼ per cent; for the next 5 years, 1½ per cent.; for the next 5 years, 1¾ per cent., and for the balance of the life of the franchise 2 per cent. The city is relieved from all responsibility for persons injured while work is being carried on in the streets; all ordinances and rules of the city are to be complied with; the petitioners are to file a bond in the sum of $10,000 for the faithful performance, and they also stipulate the right to demand a guaranty deposit from all users of gas. The ordinance, having been read once, was referred for consideration and report to the committee on laws, streets and engineering.

THE Pen Argyl (Pa.) Gas Company makes no charge for the labor, pipe and fittings required in connecting up gas ranges.

MANAGER CROWELL reports that over 12,000 appliances for cooking and heating are in use in Atlanta, Ga. Further, he says that applications for ranges are daily coming in by the dozen.

THE annual picnic of the Gas Companies Mutual Aid Society of New York, which was brought off at Manhattan Casino, the evening of the 21st inst., was certainly a credit to its officers and members. Harmonious, fraternal and enjoyable it certainly was, and congratulations are in order to Mr. Richard Shepard, Jr., Chairman of the Committee of Arrangements, and his efficient aides.

THE Ontario Power Company has contracted with the Niagara, Lockport & Ontario Power Company to deliver quite a large block of power at the international boundary line near the Devil's Hole, a point 3 miles or more down the river from the power house. The Niagara, Lockport & Ontario Power Company will transmit this power to Rochester and other places east of Niagara, it being intimated that efforts will be made to reach Syracuse and Albany, while Lockport is also an objective point. The power will be carried by cables strung across the river and suspended from towers to be erected on each side of the stream. The power designed for this transmission will pass from the generators in the the power station to the distributing station on top of the bluff and high bank over the power house, where its voltage will be raised and it will be sent to a transformer station now in course of erection on the American side of the river below the Devil's Hole, and from this station the current will be sent eastward into the interior of the State. Work at all points is progressing rapidly.

The Market for Gas Securities.

The dullness of the midsummer prevails with all its might, and mighty were the reasons why it should be so. With the mercury hovering for days well above the 93 mark, no wonder speculation was checked. The figures for the week show a slight decline in Consolidated, the closing to-night (Friday) coming in at 189½ bid, or an even point less than last week. The announcement was made this morning that Governor Higgins had appointed Mr. Frederick E. Gunnison, of Brooklyn, as the third member of the State Gas Commission, vice Mr. James R. Sheffield, declined. Mr. Gunnison is a lawyer and a man of good standing in Kings county, but knows nothing about gas.

Brooklyn Union still remains lifeless, and Peoples, of Chicago, has about recovered from its recent sharp drop.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 Wall Street, New York City.

July 24.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$73,177,000	100	189½	191
Central Union, Bonds, 5's.	3,000,000	1,000	108½	110
Equitable Bonds, 6's	1,000,000	1,000	..	102
" 1st Con. 5's	2,500,000	1,000	118	120
Mutual	3,500,000	100	300	320
Municipal Bonds	750,000	..	..	..
New Amsterdam Gas Co.. Bonds, 5's	11,000,000	1,000	111	113
New York & Richmond Gas Co. (Staten Island)	1,500,000	100	35	..
1st Mtg Gold Bds. 5 p. ct.	1,000,000	..	..	..
Northern Union, Bonds, 5's.	1,250,000	1,000	104	106
New York and East River.. Bonds 1st 5's	3,500,000	1,000	112	114
" 1st Con. 5's	1,500,000	..	106½	108½
Standard	5,000,000	100	125	130
Preferred	5,000,000	100	145	155
Bonds, 1st Mortgage, 5's	1,500,000	1,000	116	117
Yonkers	299,650	500	130	..
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	157	194
" " Bonds (5's)	15 000,000	1,000	113	115
Bay State	50,000,000	50	⅛	3/16
" ncome Bonds	2,000,000	1,000	..	75
Binghamton Gas Works	450,000	100	..	65
" 1st Mtg. 5's	500,000	1,000	93	96
Boston United Gas Co.— 1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	6	7
" " Bonds, 5's	5,250,000	1,000	66	68½
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Cincinnati Gas and Electric Co	29,500,000	100	106⅝	106⅞
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	97½	99
Columbus (O.) Gas Lt. & Heating Co	1,682,750	100	..	95
Preferred	3,026,500	100	107½	103
Consumers, Toronto	,000,000	50	200	204
Consolidated, Baltimore	11,000,000	100	83	.
Mortgage, 6's	3,600,000	..	..	118
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N.J.	1,000,000	100	15	17
" Con. Mtg. 5's	880,000	1,000	89½	92
Bonds	75,000	..	..	100
Detroit City Gas Co	4,825,500	50	..	50
" Prior Lien 5's	5,603,000	1,000	..	98
Detroit Gas Co., 5's	381,000	1,000	75	80
" Inc. 5's	16,000	100	98½	100
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Essex and Hudson Gas Co.	6,500,000	..	39	40
For Wayne	2,000,000	..	..	..
" Bonds	2,000,000	..	55	..
Grand Rapids Gas Lt. Co. 1st Mtg. 5's	1,225,000	1,000	104½	105
Hartford	750,000	25	190	200
Hudson County Gas Co., of New Jersey	10,500,000	..	104½	105½
" Bonds, 5's	10,500,000	..	107	108
Indianapolis	2,000,000	..	70	75
" Bonds, 5's	2,650,000	..	104½	105
Jackson Gas Co	250,000	50	82	..
" 1st Mtg. 5's	290,000	1,000	101	102½
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	86
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede, St. Louis	10,000,000	100	..	.
Preferred	2,500,000	100	97½	110
Bonds	10,000,000	1,000	108½	109
Lafayette Gas Co., Ind	1,000,000	100	..	60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	143	145
Madison Gas & Elec. Co. " 1st Mtg. 6's	350,000	1,000	107½	108½
" 6 per cent. scrip, due 1910	100,000	25	85	87
Montreal, Canada	2,000,000	100	218	218¾
Nashville Gas Lt. Co	1,000,000	100	110	..
Newark, N. J., Con. Gas Co.	6,000,000	..	56	58
Bonds, 6's	4,600,000	..	105	105¾
New Haven	2,000,000	25	200	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	104⅝	105
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	..	..
2d "	2,500,000	1,000	104	..
Rochester Gas & Elec. Co..	2,150,000	50	88	..
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal.	15,800,000	100	58½	58¾
St. Joseph Gas Co. " 1st Mtg. 5's	751,000	1,000	94	96
St. Paul Gas Light Co	1,500,000	100	45	47
1st Mortgage 6's	650,000	1,000	113	116
Extension, 6's	600,000	1,000	112½	115
General Mortgage, 5's	2,465,000	1,000	92	93
Syracuse, N. Y.	1,975,000	100	50	55
Bonds	2,047 000	1,000	102	.
Washington, D. C	2,600,000	20	298½	300
First mortgage 6's	600,000	..	..	..
Western, Milwaukee	4,000,000	..	..	..
Wilmington, Del	600.000	50	200	..

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(Signed) HORACE McKAY,
Chairman Finance Committee.

Attest: BEMENT LYMAN,
Secretary.

Indianapolis, Ind., May 27th, 1905. [Seal.]

1566-3m

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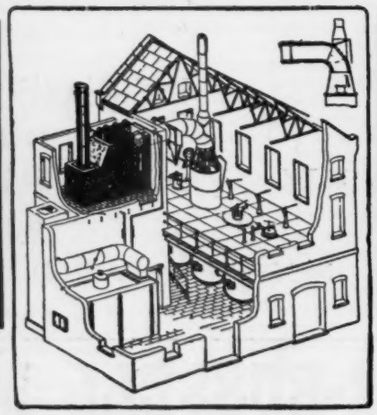

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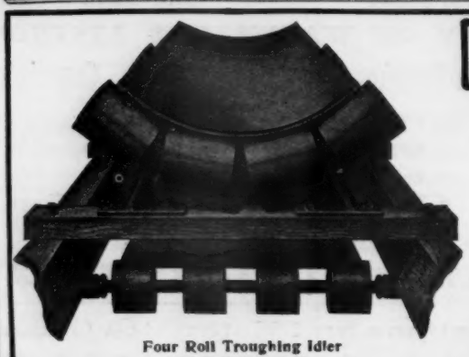

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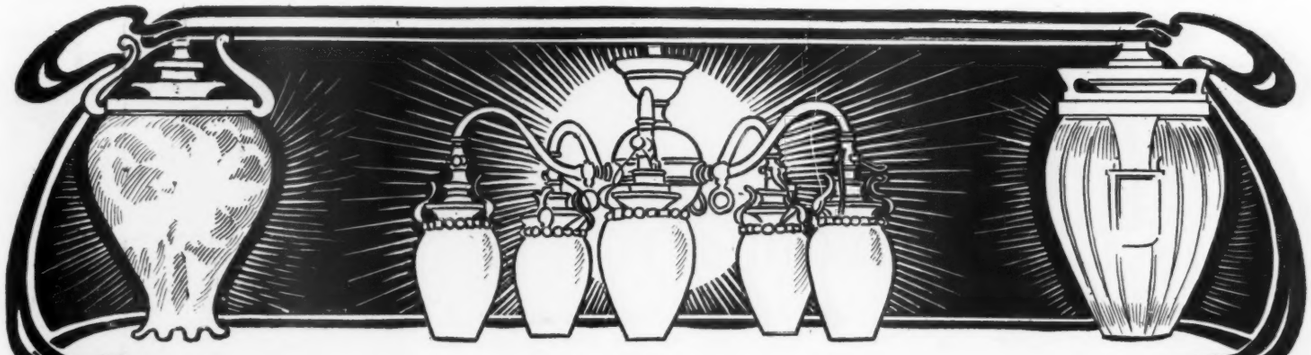

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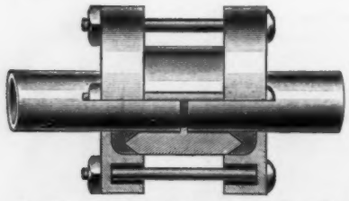
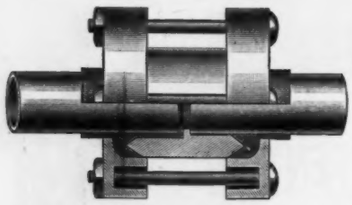
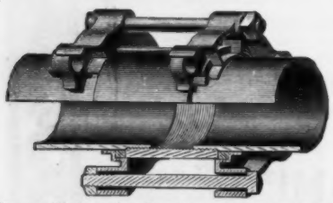


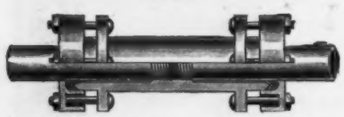
Regular Coupling, Style 1, for Plain End Wrought Iron Pipe.



Insulating Coupling, Style 5, for Plain End Wrought Iron Pipe,



Clamp, Style 4, for Repairing Leaks on Screw Collar.



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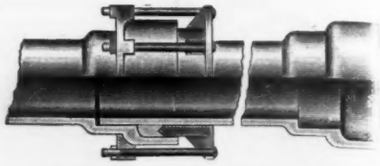
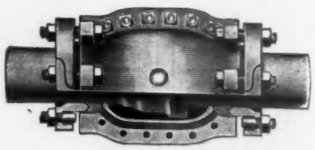
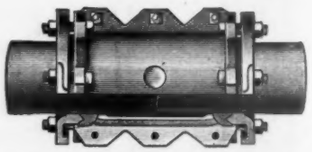


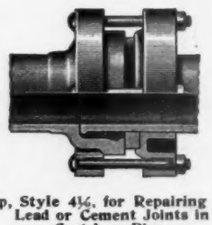
Coupling, Style 9, for Special Style Cast Iron Pipe.



Split Sleeve for Repairing Broken Bell on Cast Iron Pipe.



Split Sleeve for Repairing Broken or Cracked Cast Iron Pipe.



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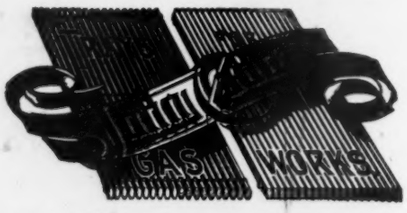

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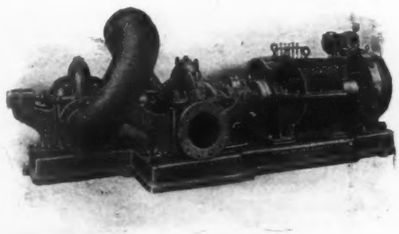

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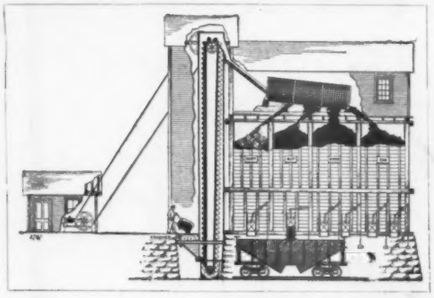

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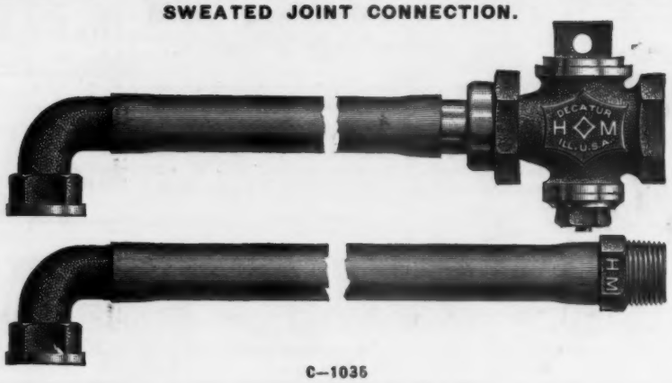

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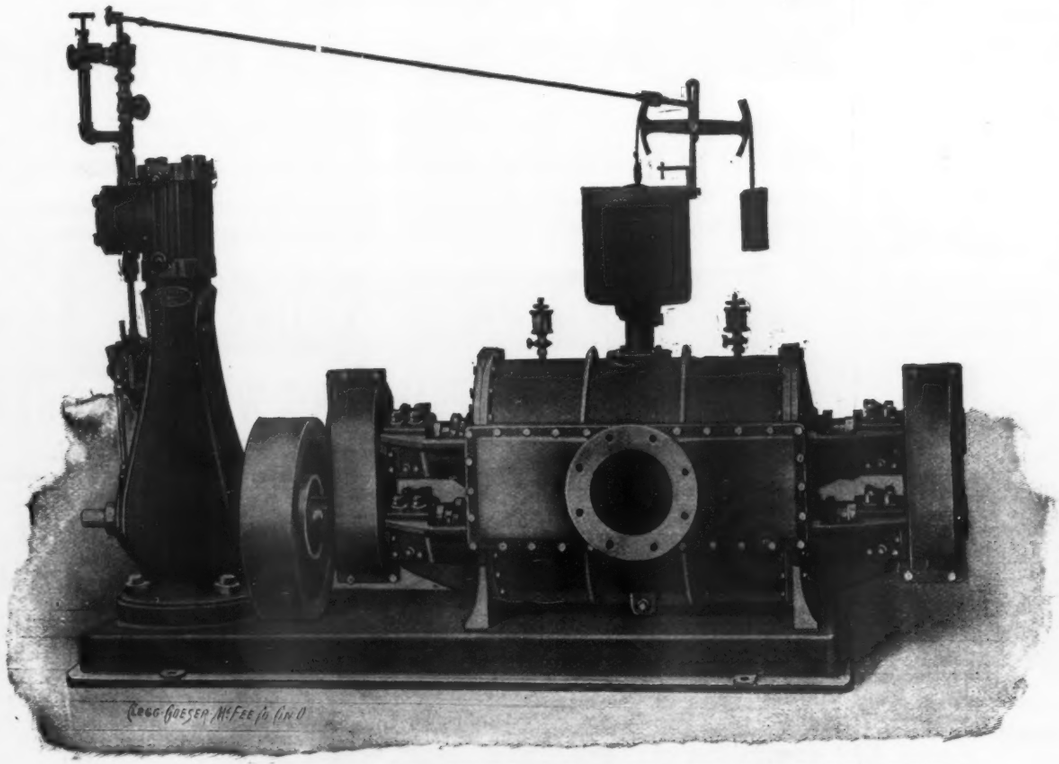

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WITHOUT ANY ESCAPE OF GAS.

They are Strong and Compact.

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Machines Sent to any Gas Company for Thirty Days' Trial.

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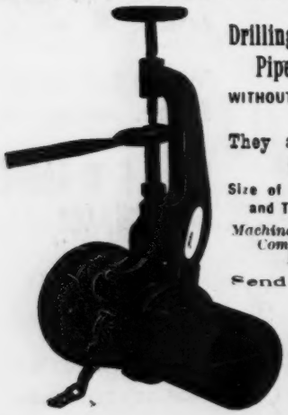

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Mueller Dry Pipe Tapping Machines, including the Mueller "Regular," "Our Special" and "Our Special No. 2," comprise a line unequal for their class of work. They are made strong, are easily attached to the pipe, and are easy to operate under all conditions of use. All dry pipe machines make taps from ⅝ to 3-inch in any size of pipe. Unconditionally guaranteed. Catalogues upon application.

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Temporarily during alterations and repairs. : : : :

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PUBLIC LIGHTING TABLE.

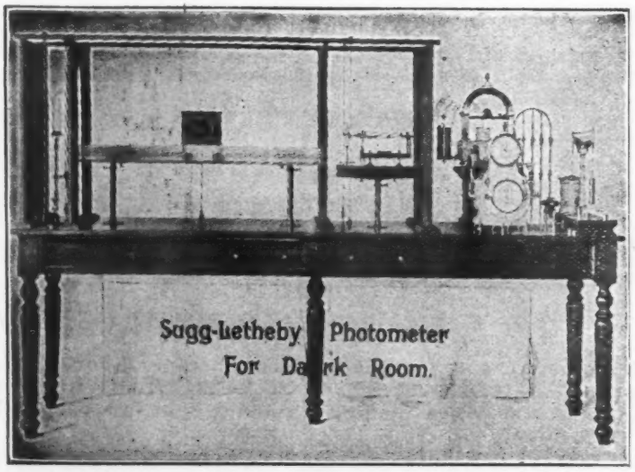
AUGUST, 1905.

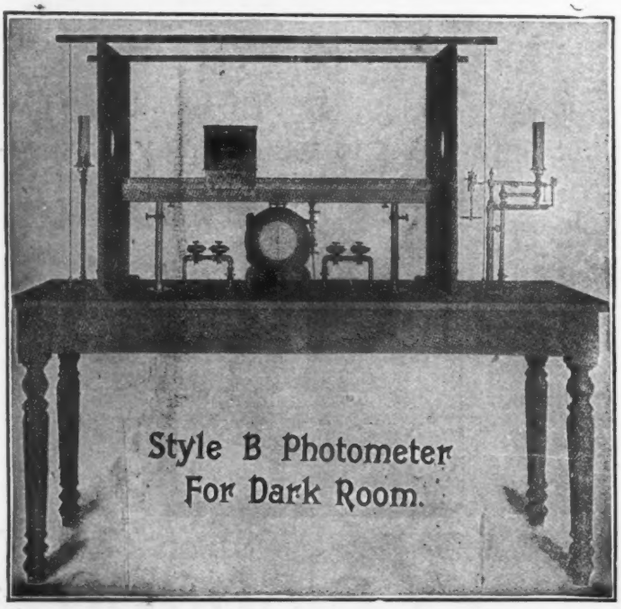
Day of Week.	Date.	Table No. 1. FOLLOWING THE MOON. Light.	Extinguish.
Tue.	1	7.40 PM	4.00 AM
Wed.	2	7.40	4.00
Thu.	3	7.40	4.00
Fri.	4	7.40	4.00
Sat.	5	9.10	4.00
Sun.	6	9.40	4.10
Mon.	7	10.20 FQ	4.10
Tue.	8	11.00	4.10
Wed.	9	11.50	4.10
Thu.	10	12.40 AM	4.10
Fri.	11	1.30	4.10
Sat.	12	2.30	4.10
Sun.	13	No L.	No L.
Mon.	14	No L. FM	No L.
Tue.	15	No L.	No L.
Wed.	16	7.30 PM	8.50 PM
Thu.	17	7.30	9.20
Fri.	18	7.30	9.50
Sat.	19	7.30	10.20
Sun.	20	7.20	10.50
Mon.	21	7.20	11.20
Tue.	22	7.20 LQ	12.00
Wed.	23	7.20	12.30 AM
Thu.	24	7.20	1.20
Fri.	25	7.20	2.10
Sat.	26	7.20	3.00
Sun.	27	7.10	4.20
Mon.	28	7.10	4.20
Tue.	29	7.10	4.20
Wed.	30	7.10 NM	4.20
Thu.	31	7.10	4.20

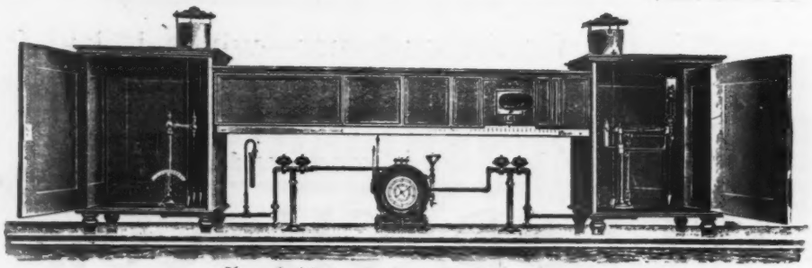
TOTAL HOURS DURING 1905.

By Table No. 1.

	Hrs.Min.
January	240.50
February	192.20
March	207.00
April	175.10
May	161.00
June	139.50
July	149.00
August	161.50
September	173.00
October	205.00
November	211.00
December	229.00
Total, yr.	2245.00







Closed Photometer For Light Room.

CIRCULARS SENT ON REQUEST.

PUBLIC LIGHTING TABLE.

AUGUST, 1905.

Day of Week.	Date.	Table No. 2. NEW YORK CITY. ALL NIGHT LIGHTING. Light.	Extinguish.
		P.M.	A.M.
Tue.	1	7.10	3.30
Wed.	2	7.10	3.30
Thu.	3	7.10	3.30
Fri.	4	7.10	3.30
Sat.	5	7.10	3.30
Sun.	6	7.10	3.45
Mon.	7	7.10	3.45
Tue.	8	7.10	3.45
Wed.	9	7.10	3.45
Thu.	10	7.10	3.45
Fri.	11	7.10	3.45
Sat.	12	7.10	3.45
Sun.	13	6.55	4.00
Mon.	14	6.55	4.00
Tue.	15	6.55	4.00
Wed.	16	6.55	4.00
Thu.	17	6.55	4.00
Fri.	18	6.55	4.00
Sat.	19	6.55	4.00
Sun.	20	6.45	4.10
Mon.	21	6.45	4.10
Tue.	22	6.45	4.10
Wed.	23	6.45	4.10
Thu.	24	6.45	4.10
Fri.	25	6.45	4.10
Sat.	26	6.45	4.10
Sun.	27	6.30	4.20
Mon.	28	6.30	4.20
Tue.	29	6.30	4.20
Wed.	30	6.30	4.20
Thu.	31	6.30	4.20

TOTAL HOURS DURING 1905.

By Table No. 2.

	Hrs.Min.
January	423.20
February	355.25
March	355.35
April	298.50
May	264.50
June	234.25
July	243.45
August	280.25
September	321.15
October	374.30
November	401.40
December	433.45
Total, yr.	3987.45

NEW YORK, 97 Liberty Street. BOSTON, 814 Beacon Building. PHILADELPHIA, Broad and Arch Streets. ST. LOUIS, 712 Roe Building. CHICAGO, Foot of Orleans Street. SAN FRANCISCO, 712 Polk Street.

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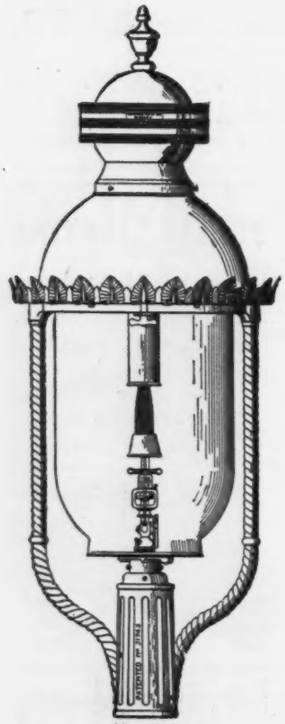
.... OF AMERICA ....



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By means of the Welsbach System of street lighting the superiority of GAS over electricity for street lighting has been fully demonstrated.

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Springfield, Ills.	**Ludington, Mich.**	**Indianapolis, Ind.** (2d contract).
Oneonta, N. Y. (2d contract).	**New York,** Mutual Co. (2d contract).	**Hazleton, Pa.**
Pottsville, Pa. (2d contract).	**St. Louis, Mo.** (4th contract).	**Mahanoy City, Pa.**
Evansville, Ind. (2d contract).	**Sioux City, Ia.** (3d contract).	**Nanticoke, Pa.**

TOTAL SETS TO JULY 1ST, 1905, ... 585
TOTAL DAILY CAPACITY TO JULY 1ST, 1905, . 455,980,000 CU. FT.

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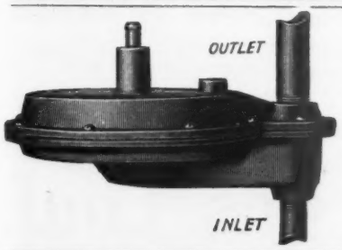

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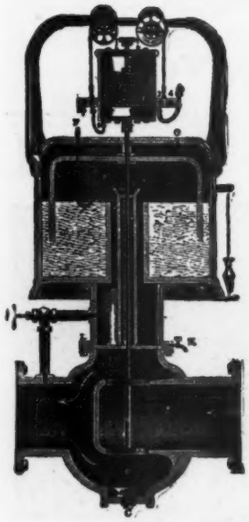

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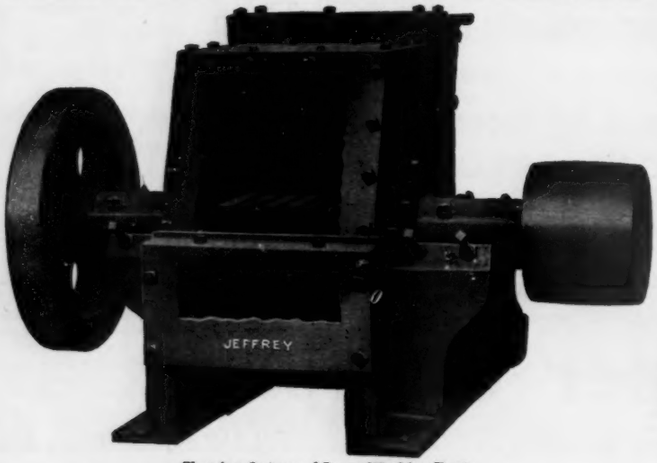

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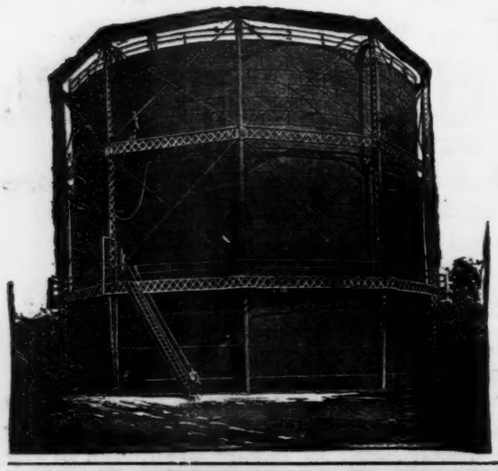

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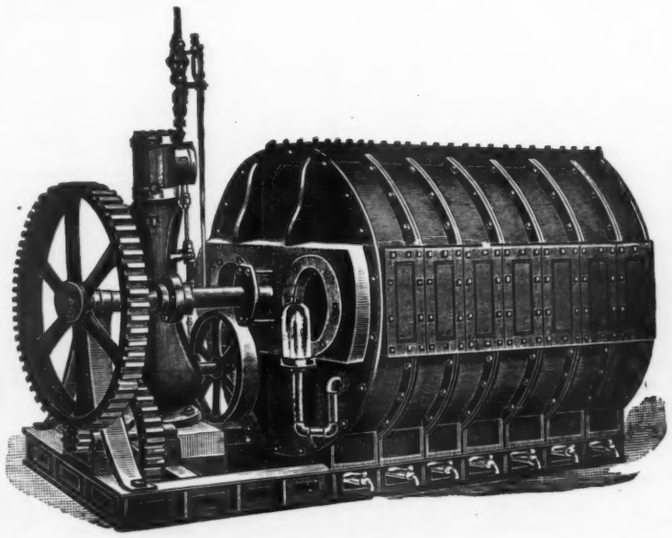

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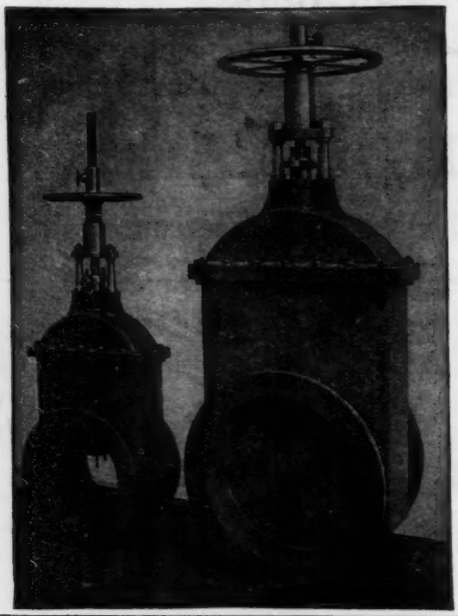

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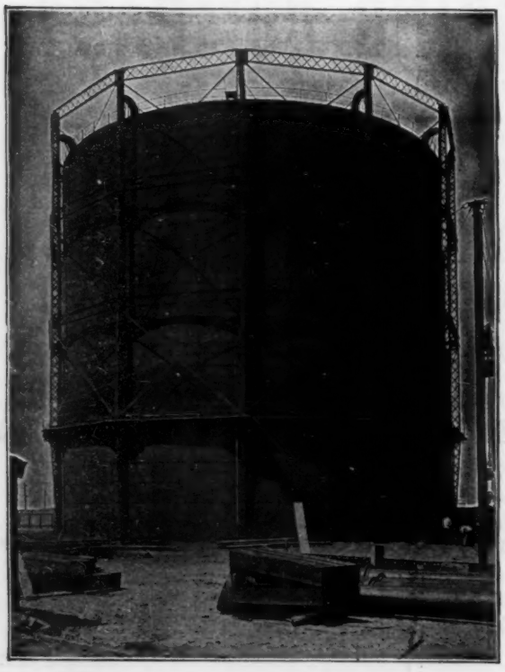

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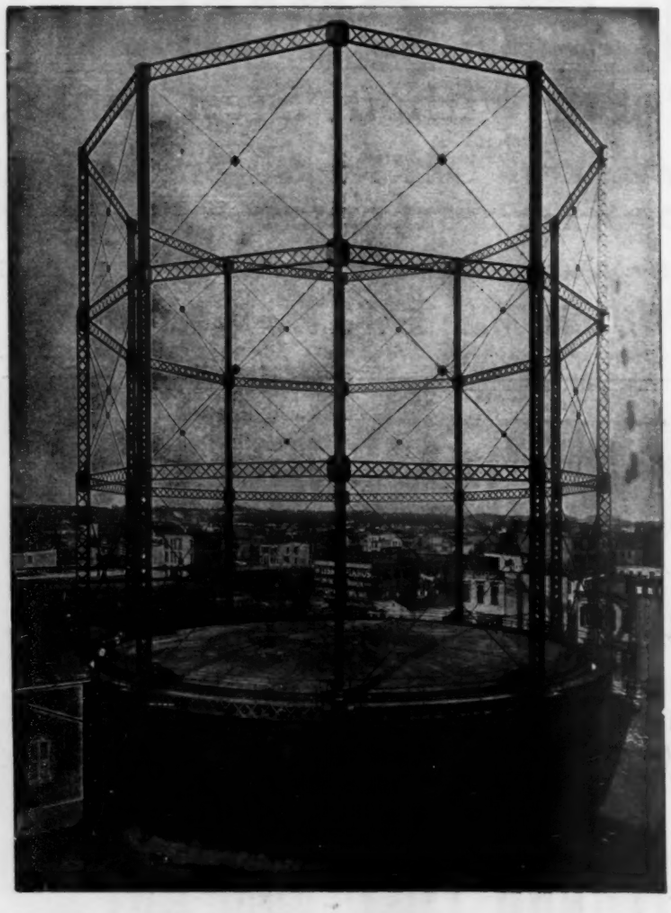

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